THE

# JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXIII. No. 578.] LONDON, JUNE 9, 1874. [26TH YEAR.] Price 6d.

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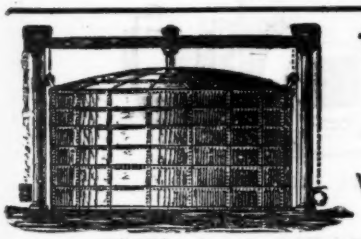

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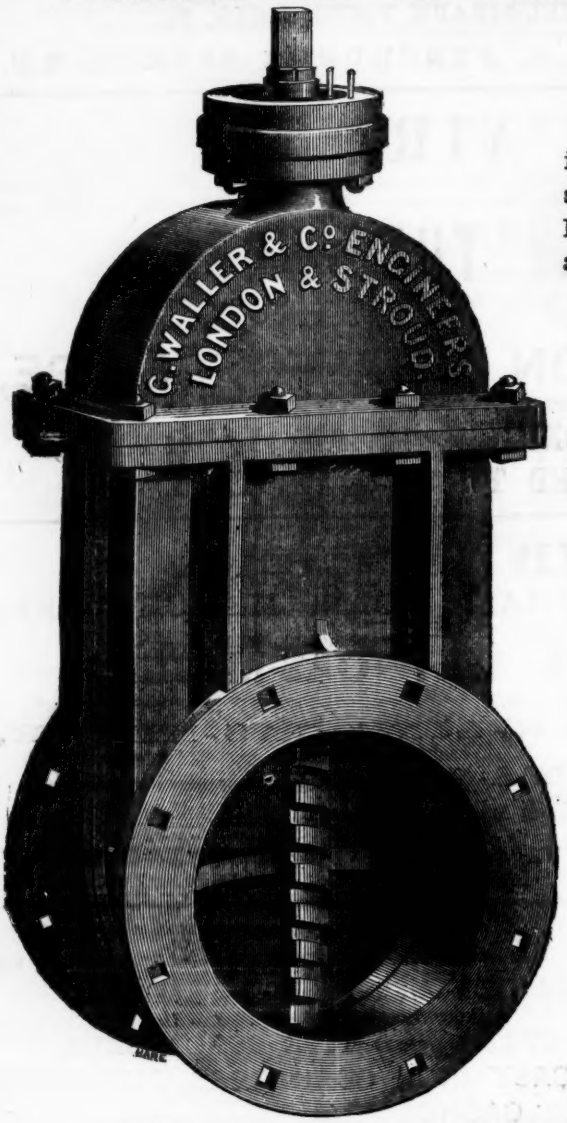
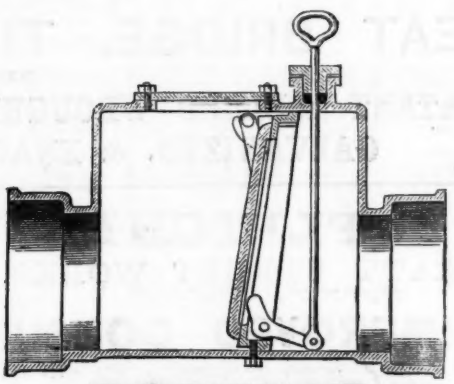
## BEALE'S IMPROVED PATENT GAS-EXHAUSTERS, COMBINED ENGINES AND EXHAUSTERS.

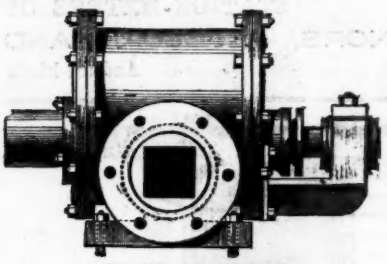



**DOUBLE-FACED GAS-VALVE.**

**The Door has a wedged back, the Body is cast in one piece, and the Valves are proved on both sides to 30 lbs. per square inch. The Index has large studs to indicate how far the Valve is open, and they can be readily felt in the dark.**



SELF-ACTING BYE-PASS VALVE.



BEALE'S EXHAUSTER.

**PUMPS, VALVES (2 in. to 30 in.), HYDRAULIC REGULATORS, ENGINES, &c., in STOCK.**

## PHŒNIX ENGINEERING WORKS, HOLLAND STREET, SOUTHWARK, S.E.,

AND AT

STROUD, GLOUCESTERSHIRE.

1862.

# PATENT ANTIMONY PAINT.

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MADE ONLY BY

## GEORGE HALLETT & CO.,

296, ROTHERHITHE, LONDON, S.E.

This Paint having been in general use over twelve years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

Reference is kindly permitted by the Engineers of the City of London, Commercial, London, and Surrey Consumers Gas Companies, who pronounce it the best Paint known for their purposes.

**N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.**

**SPECIAL DRIERS FOR ANTIMONY PAINT SUPPLIED.**

# WILLEY AND FORD,

## GAS ENGINEERS,

## WORKS: COMMERCIAL ROAD, EXETER,

INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

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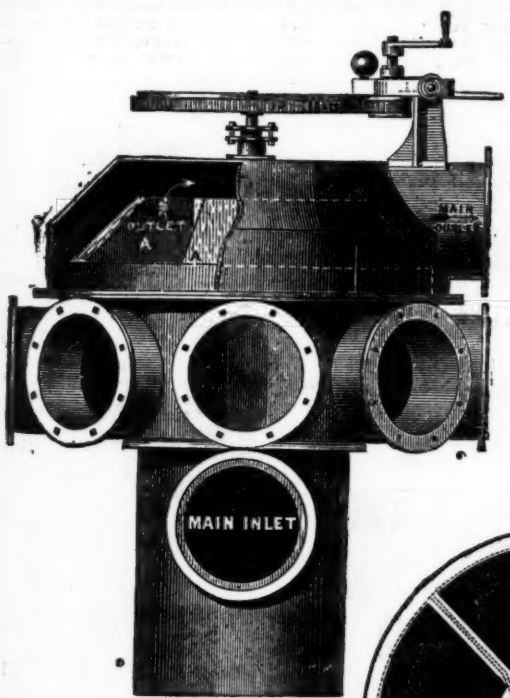
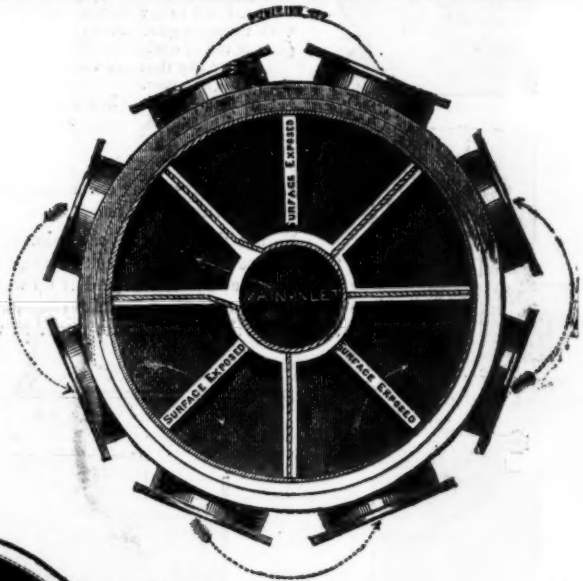
## GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

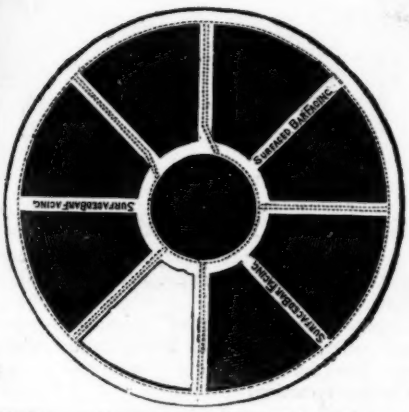
# C. & W. WALKERS' PATENT CENTRE-VALVES.




Elevation of the Centre-Valve for four Purifiers. The safety cover is shown broken, to enable the Valve itself, which is inside, to be seen.




Plan of the Body, showing the Valve lying in it, with three of the facings, which were formerly exposed to settlements of dirt, carbon, naphthaline, &c., but which are now always covered by the surfaced bar-facings of the Valve. (See below.)




Plan of the Valve, or upper portion, showing the surfaced bar-facings referred to above.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A very considerable improvement and saving is effected in the cost of the connecting-pipes.

### FOUR-WAY CENTRE-VALVES FORMING INLET, OUTLET, AND BYE-PASS.

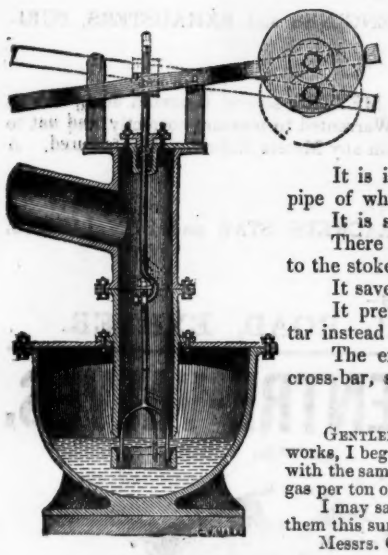
MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

# CAFFALL, THOMAS, & CO., LIMITED.

# PATENT IMPROVED SEAL

FOR

# GAS HYDRAULIC MAINS.



It relieves the retorts from all pressure during the time gas is being made.

The end of the dip-pipe not being immersed in the tar, permits the gas to pass freely, and without pressure, from the retort into the hydraulic main.

The dip-pipe can be effectually sealed without trouble, to resist the back rush of gas, *to any possible pressure*, during the time of charging; but in the event of the Seal being left on, after the retort is closed, no inconvenience is caused, as the piece of pipe used as the Seal only lengthens it to an ordinary dip-pipe.

It is inexpensive, and can be easily and readily applied to any existing hydraulic main and dip-pipe of whatever shape or size, at a trifling cost.

It is simple in its arrangement, and cannot get out of order.

There is no deposit of carbon on the top of the retort, thereby saving considerable time and trouble to the stokers when drawing and charging, also the injury caused by scurfing the retort is avoided.

It saves 10 per cent. of the coal carbonized; also the same proportion of fuel, retorts, labour, &c.

It prevents the thickening of the tar in the hydraulic main, as the heated gas passes *over* the tar instead of being forced *through* it.

The extension piece of pipe is moved by a lever, from which hangs a $\frac{3}{8}$-inch rod, hooked on the cross-bar, so that the lid of the retort cannot be struck without first sealing the pipe.

*Alton Gas and Coke Company, Alton, Hants, April 25, 1874.*

GENTLEMEN,—In reply to your inquiry respecting your Patent Dip for Hydraulic Gas-Mains in use at these works, I beg to say that, upon looking into our carbonizing account for the last 12 weeks, and comparing the result with the same quarters of the past five years, I find that your Dip has given our Company an increase of 1286 feet of gas per ton of coals beyond the make in the other years, notwithstanding the retorts have been in use for three years.

I may say that our Company are so satisfied with the Dips that it is intended to fit up the other retorts with them this summer.

I am, gentlemen, your obedient servant,

Messrs. Caffall, Thomas, and Co., Limited, 28, Gracechurch Street. WM. TRIMMING, Secretary.

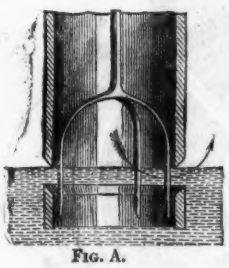


FIG. A.

Figure A shows the extension piece lowered to permit the gas to pass out of the dip-pipe without pressure.

Figure B shows the extension piece raised against the end of the dip-pipe, thereby preventing any back passage of the gas during the time of drawing and charging; and should it be left up while the gas is being made, no inconvenience is caused, *nor danger of bursting the retorts incurred; it being an open pipe and not a solid plug*, the gas will pass under as with the usual dip-pipe.

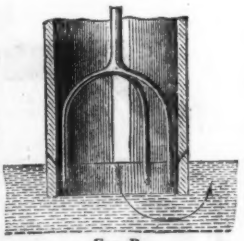


FIG. B.

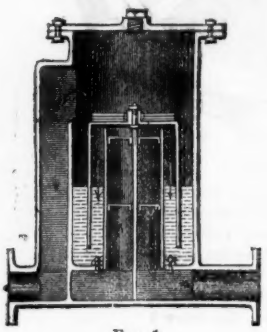


FIG. 1.

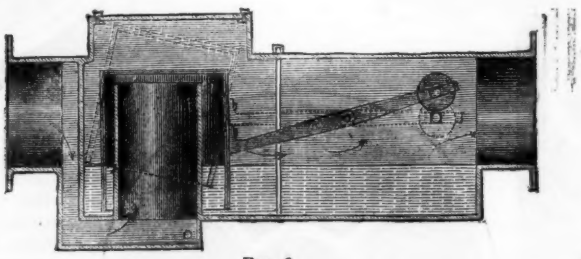


FIG 3.

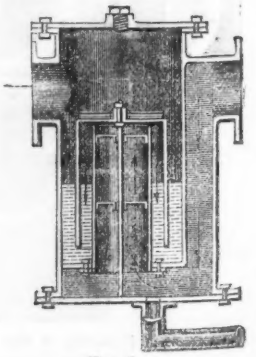


FIG. 2.

## BYE-PASS FOR EXHAUSTER (Fig. 1).

This Hydraulic Bye-Pass has been invented for the purpose of supplying to gas companies a cheap, effective, and self-acting valve. It is simple in its construction, cannot get out of order, perfect in its action, can be made to stand any pressure, occupies very little space, and can be adapted to any existing pipes.

Fig. 2 is a Valve similar to Fig. 1, but made to act as a self-acting hydraulic bye-pass for washers, condensers, scrubbers, and meters; the Valve part being *below* the inlet and outlet, so that it may be applied to underground mains. Both Valves can be fitted to existing mains without disturbing them, more than the cutting out of a sufficient length to permit the fitting in of the Valve; after being properly fitted, they will require no further attention.

## SELF-ACTING HYDRAULIC SAFETY-VALVE (Fig. 3),

For preventing the back flow of gas from the gasholder, and thereby preventing the possibility of accidents (the great damage and danger to life and property resulting therefrom) through the breaking of pipes, unsealing of purifiers, or any other cause. It is easy and prompt in its action, for upon the forward pressure of the gas ceasing, the bonnet *instantly* closes over the stand-pipe, thereby effectually preventing any return of the gas; no extra pressure is put upon any part of the works by its use, and it can be made to stand any required pressure.

*Every information can be obtained, and Models seen, at the Offices of the Company,*

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# TANGYE BROTHERS AND HOLMAN,

## LAURENCE POUNTNEY LANE, LONDON, E.C.,

SOLE MAKERS OF

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WITH

## HOLMAN'S PATENT ECCENTRIC FASTENINGS.

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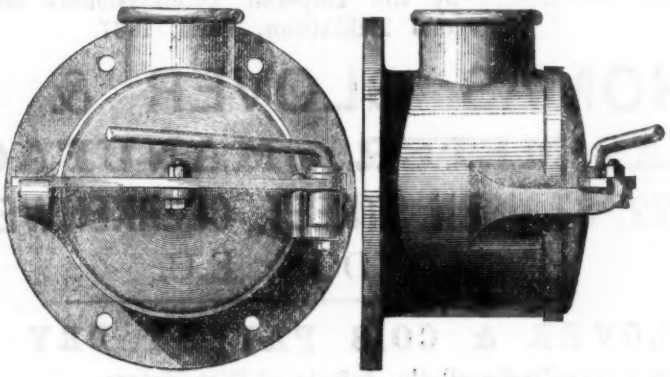

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These Lids are proved by many eminent Gas Engineers to be the most efficient, saving much time, labour, and expense; are opened and closed as quickly and with as little trouble as an ordinary furnace door, and by their use the Retorts are soundly sealed during the whole period of carbonization.

**These Lids are Adopted by the following (among many other) Gas Companies:—**

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" London Gaslight Company.
" Independent Gaslight Company.
" Phœnix Gaslight Company.
" South Metropolitan Gaslight Co.
The West Ham Gas Company.
" Imperial Gaslight Company.
" Gas-Works, Arsenal, Woolwich.
" Commercial Gas Company.
" Alliance and Dublin Gas-Works.
" Edinburgh Gas-Works.
" Manchester Corporatn. Gas-Works.
The Salford Corporation Gas-Works.
" Rochdale Corporation Gas-Works.
" Liverpool United Gas-Works.
" Birkenhead Gas-Works.
" Birmingham Gas-Works.
" Nottingham Gas-Works.
" Newcastle-on-Tyne Gas-Works.
The Carmarthen Gas-Works.
" Merthyr Tydfil Gas-Works.
" Ystrad Gas-Works.
" St. Alban's Gas-Works.
" Over Darwen Gas-Works.
" Aylesbury Gas-Works.
" Cardiff Gas-Works.

The Morton's Lid is made circular in form, that being the most convenient and suitable shape. It can be used for Retorts of any section, by adapting the Mouthpiece casting from the D, oval, or other shape, at the back, to circular in front.

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"Dear Sir,—In reply to your inquiry, I have the pleasure of stating that the whole of the Mouthpieces at Beckton have Morton's Lids attached to them, and they have given us every satisfaction. We have 2160 in use.—I remain, yours truly, (Signed) "F. J. EVANS."

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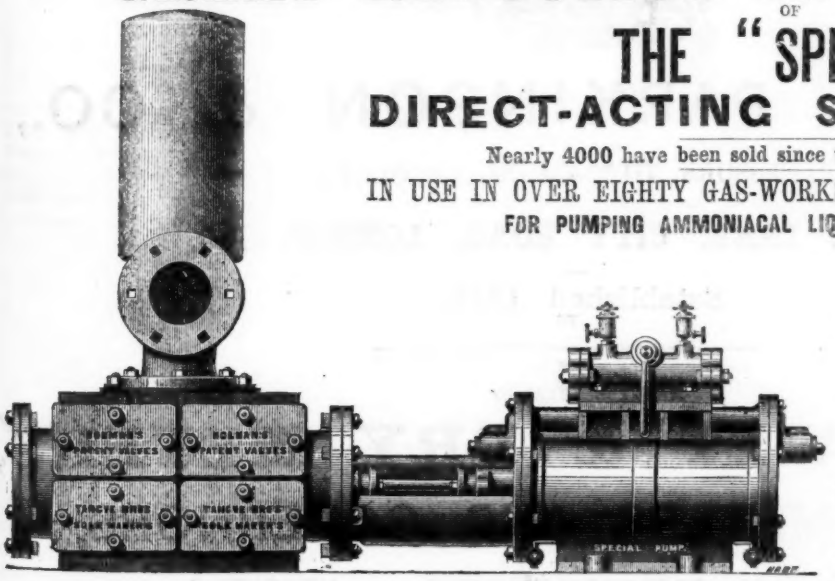
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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diam. of Steam Cylinder .. In. | 3 | 4 | 4 | 6 | 4 | 6 | 6 | 7 | 6 | 8 | 7 | 10 | 8 | 10 | 12 |
| Diam. of Water Cylinder... " | 1½ | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 9 |
| Length of Stroke ..... " | 9 | 9 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 18 | 18 | 24 |
| Diam. of Suction & Delivery " | 1 | 1¼ | 2 | 2 | 3 | 3 | 3½ | 3½ | 4 | 4 | 5 | 5 | 6 | 6 | 7 |
| Gallons per Hour, approximate. | 680 | 815 | 1830 | 1830 | 3250 | 3250 | 5070 | 5070 | 7330 | 7330 | 9750 | 9750 | 13,000 | 13,000 | 16,500 |
| REDUCED PRICES . . | £16 | £18 | £20 | £25 | £25 | £30 | £35 | £40 | £40 | £50 | £50 | £65 | £65 | £75 | £110 |

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

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Paris, 1867.

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7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

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(SUCCESSORS TO SAMUEL CROSLEY,)

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# THE JOURNAL OF GAS LIGHTING,
## WATER SUPPLY, & SANITARY IMPROVEMENT.

*TUESDAY, JUNE 9, 1874.*


## Circular to Gas Companies.

MAJOR BERESFORD'S Confiscation Bill, which, as we have said, is of as much interest to gas as to water companies, has been shelved in a way we did not foresee. It is one of those hybrid measures difficult for those unskilled in parliamentary practice to characterize as either a public or a private Bill. A suspicion appears to have arisen that it should be classified in the latter category, and, on the motion of its proposer, the order for the second reading has been discharged, and it is remitted to the Examiners of Private Bills. The probabilities are that the Bill is lost for this session, and, indeed, for all time. We may confess to a regret that it has not been considered on its merits, or rather its demerits, by the House of Commons, for we should have been glad to have had a gauge of the opinion of the House respecting such a measure, quite unique in its character. We notice that one solitary petition has been presented to the House in favour of the Bill. It came from that busy body, the Society of Arts. We are not surprised at it. Any measure that promises a Government Commission finds favour in the Adelphi. The society, we have no doubt, would undertake to provide all the commissioners. Mr. Edwin Chadwick, C.B., would, perhaps, give up his pension, and take the chief commissionership, for a sufficient consideration; or the modest and accomplished secretary of the society would undertake the duty, if adequately remunerated. Government Commissions, however, are not in favour with the public just now, who are anxious to manage their own affairs, and are more competent to do so than any Government Commission.

The House of Lords have disposed of the Tunbridge Wells Gas Bill in a very perfunctory manner. After hearing the case for the company, which was as conclusively in favour of the Bill as unshaken evidence could make it, and without learning more of the grounds of opposition than could be gathered from a little cross-examination of the company's witnesses, their lordships consulted for a few minutes, and then decided that it was not expedient to proceed further with the Bill. After the full inquiry which took place before the committee of the House of Commons, and the decision, we certainly expected a different result; but at the same time informed our readers that the sympathy of the Lords might be excited on behalf of one of their order, who, although not opposing publicly, might look with disfavour on the scheme of the company. The opposition was joined in by landowners, and, as a matter of course, by tenants, and also by the lord of the manor; and, inasmuch as the interest of landowners is the predominate consideration in the House of Lords, the rejection of the Bill might have been anticipated. The actual result, it cannot be disguised, places the company in difficult circumstances; but their last card cannot yet be played, and by energy and prudence the nefarious designs of the Town Commissioners may still be defeated.

The designs of the Worcester Town Council are now unmasked, and it is confessed that the ultimate object of the proceedings they proposed to take against the gas company was the acquisition of the undertaking. They have now, however, decided to proceed in a more straightforward manner. The report of the Watch and Lighting Committee, which recommended that the opinion of eminent counsel should be taken with a view to litigation with the company, has been sent back to the committee, with a recommendation to consider the propriety of opening negotiations with the gas company for the purchase of the gas-works. So far this is honest, and we have no doubt the gas company will meet the council in an equally straightforward way. The allegations against the company, as reported in the speeches of members of the Town Council, are so vaguely stated, that it is impossible for us to pretend to come to any conclusion respecting them. They seem to show, as we intimated before, that things have been charged to revenue which might have been carried to capital account, and therefore the company have made more than their legitimate profit of 10 per cent. An accusation is also made that the company have availed themselves of their full borrowing powers before the whole of their capital has been subscribed. There is also a charge that the contingent and reserve funds have not been invested as the Worcester Gas Act, 1848, prescribes. It must be admitted that there is an odd look about the accounts as detailed by the Town Council committee. For instance, it is said that the contingent and reserve fund is limited by the Act to £5000, yet they stood in the accounts for 1866 at £26,646, but in the following year dropped to £505, "sweeping at once out of the balance-sheet £26,141." This statement is made on the strength of the accounts deposited by the company with the clerk of the peace, and, of course, some explanation will be forthcoming, though it has not yet been made to the Town Council.

At Worcester, as elsewhere, exaggerated notions are entertained respecting the advantages to be derived from the possession of gas undertakings by the municipal authority. From information we are collecting, we hope soon to be able to show that, whatever good may have resulted, it has not been a reduction of taxation. We are bound to admit that in some cities—Manchester, for example—things have been done, the cost of which, in the absence of gas profits, could only have been paid by additional taxation; but this, we contend, is not a legitimate application of gas profits. A member of the Town Council of Worcester quotes the case of Burnley, in which borough he states that the gas profits last year amounted to £3527. He goes on to assert that the rates have been reduced to a fraction over 9d. in the pound. But in this calculation he clearly excludes the highway rate, which in Burnley is the equivalent of an improvement rate, and which is 1s. in the pound—bringing up the total borough rating to 1s. 9d., or only 3d. less than in Liverpool, where the gas-works belong to a company, and the Corporation have large household property. We may also point out that the lighting rate in Liverpool is only 1¾d., while in Burnley it is 3¼d. It is very easy to make gas-works appear profitable by taking money out of one pocket and putting it into another. Taken altogether, the discussion is carried on at Worcester in such an admirable spirit that we cannot but believe that a speedy and satisfactory settlement will be arrived at. The company will, of course, decide on retaining possession of their property, but will, no doubt, make all reasonable concessions. On the other hand, the Town Council may be induced to take a wider view of the matter, and ask themselves whether or not it is advisable to put an additional tax on a section of the community, and call it gas profits.

The Local Board of Ramsgate, we are pleased to see, have adopted the system of average meter indication for their public lamps—one meter to every 12 lamps. We see it stated by Mr. Dresser Rogers, in a speech at the opening of the Paddington Baths, that the adoption of the system in the parish is likely to result in a saving of, at least, one halfpenny in the pound to the ratepayers. It must not be supposed that this is so much loss to the gas company; we believe that gas companies profit as much as ratepayers by the adoption of the system.

The shareholders of the Air Gaslight Company have turned out

all the directors who wished to save their pockets by winding up the concern, and have elected a new set pledged to fortune—or bankruptcy; which of the two is not doubtful. Mr. Harrison, who is now on the Board, and will, of course, have it all his own way, has taken out another patent, which, if carried out, he says will enable him to return a good dividend to the shareholders. We do not believe it; but "hope springs eternal in the human "breast," and the unfortunate shareholders, who have already lost £114,000, are willing to submit to another call in the vain expectation of retrieving their losses. Their perseverance and constancy deserve a better reward than they are likely to obtain. We do not like to be cruel; but, remembering what we said when the concern was started, we may quote from the final address of the Veiled Prophet to his deluded followers, and say to these unfortunate but still hopeful gentlemen:

Ye would be dupes and victims, and ye *are!*

The complaints respecting the gas supply at Newcastle have found their way to the ears of the Town Council, and the Gas Committee of the Corporation have been instructed to inquire into the allegations of deficient quantity, impure quality, and increased registered consumption. That the company have been endeavouring to sail close to the wind as regards illuminating power seems clear, but that is not to be wondered at, considering the crisis through which they have passed. With coals at recent prices, liberality in that respect was not to be expected. With better times the company will no doubt return to their previous standard, considerably in excess of the parliamentary requirements. As regards the accusation of an excess of pressure in the mains, which occasions a loss to the consumer, it must be pointed out that the engineer of the company is the best judge of the pressure required for the proper supply of his district, and, for the sake of his employers, he is not likely to put on more than is necessary. When the gas reaches the premises of a consumer, it is his business to provide means for a reduction of the pressure by the adoption of a governor and proper burners, so that the gas may be economically consumed. The gas company must not be charged with what is really the result of the consumer's own negligence. As regards meters, we have often advocated a more frequent inspection of these instruments, for the reason that they as often, perhaps more often, register against than in favour of the gas company; but this consumers are never willing to believe. The Newcastle Company may contemplate the proceedings of the Town Council Committee without fear, for, if properly conducted, they can only lead to the enlightenment of the public on some important points, and, consequently, to a better understanding.

We publish to-day a preliminary notice "On a New System of Photometry for Gas—the Differential Photometer," by Dr. Wallace, of Glasgow. It is impossible to form any opinion as to the value of the new system until the author has fully developed his plan; but the scientific standing of the writer will command attention to his views.

The Improved Station Governor, devised by Mr. Elliott, which is figured and described in another column, is certain to receive the attention of our readers. The perfect steadiness of the pressure maintained, and the diminished, if not altogether avoided risk of explosion, are recommendations which will not be overlooked.

We must content ourselves to-day by simply announcing the fact that Mr. R. H. Patterson has published a new and enlarged edition of his pamphlet on "Gas Purification." Some of the new matter, we think, will require notice at a future time; but the book reached us too late for any review to be possible in this number.

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STOPPAGES IN ASCENSION-PIPES.—Mr. A. Malam, of Dumfries, writes to say that the arrangement described by Mr. Mackenrot in our last JOURNAL is an infringement of his patent. Mr. Mackenrot, who has been threatened with legal proceedings if he attempts to carry his arrangement into practice, has also written to us, denying that there is any identity between the two arrangements for effecting the same object. He asserts that if he has infringed any patent, it is one taken out more than 40 years ago, by a Mr. Hall, for surface condensers, and which has been adopted in the Royal Navy. Mr. Malam's invention of condensing mouthpiece was described and illustrated in the JOURNAL for April, 1873, page 324. We think it would be unwise, under existing circumstances, to publish the letters received from our correspondents.

GLASGOW WATER SUPPLY.—The Loch Katrine water supplied to Glasgow during the month of May is reported by Professor Bischof to have been clear, although of a slightly yellowish tint from peaty matter; it was very soft, and free from evidence of previous sewage or animal contamination.

BECKTON GAS-WORKS.—Messrs. Gwynne and Co., of Essex Street Works, Strand, have just completed for the Beckton gas station three complete sets out of five of gas-exhausting machinery. Each exhauster is capable of passing 167,600 cubic feet per hour, and is on the well-known Gwynne and Beales plan. The engines and exhausters are combined and direct acting, all intermediate gearing being thereby avoided. The engines are high-pressure expansive condensing engines, of 25-horse power each nominal, and are got up in a most superior manner. This exhausting machinery is the finest ever yet made, and any engineers now visiting London for the gas managers meeting can see it by calling at Messrs. Gwynne's works, and will receive every attention.

## WATER AND SANITARY NOTES.

IT will be remembered that at a recent meeting of the Water Committee of the Liverpool Corporation, Mr. Robertson Gladstone expressed an opinion that the supply of water to large towns is an imperial duty, not merely the business of the municipal body. Other members agreed with him, and hence we are not astonished to see that the principle of the Metropolis Water and Fire Prevention Bill is looked on with favour in Liverpool. Burdened as that city now is with a debt of 2½ millions on account of waterworks, and with the prospect of being compelled to spend another million or more within a few years, the State is looked to for assistance, even by the second city in the empire. It would, no doubt, be a great saving to Liverpool if they could borrow money at a low rate of interest, and pay off their present debt. They might add another million to the debt, and still save. We quite agree with the chairman of the Water Committee in the opinion that the metropolis is entitled to no exceptional privileges. If London is to have money from Government at a cheap rate, Liverpool may equally claim the advantage. The doubt we have is whether it is advisable that either should be led to regard the State as "a nursing mother."

We recently alluded to the opportunity Sir R. Anstruther proposes to give Scottish municipalities of making money by going into the liquor trade. These bodies would, of course, apply to Government for the money wherewith to buy up the public-houses, and we do not see how they could be refused. *The Times*, we are somewhat astonished to notice, recommends the Home Secretary to allow the permissive adoption of the Gottenburg system in Scotland. It thinks that municipalities might supply their inhabitants with beer, as they often do with water and with gas. They might also—and, unless human nature has changed and history has been written in vain, it will one day be demanded that they shall—supply bread and meat. That day may be distant; but, in the meantime, the absorption of strictly commercial undertakings by municipalities, and cheap loans from the State, make it difficult for people to know what to do with their savings. Foreign loans, presently to be repudiated, are taken up, and swindling companies are successful, because sound investments at a reasonable rate of interest at home are becoming fewer and fewer. The absorption of gas and water undertakings by local authorities reduces them to a notable extent; and, from the point of view here suggested, the transfer can only be regarded as an unmixed evil.

At Beverley a curious spectacle is presented. It is a thriving town, with over 10,000 inhabitants, but the water supply is limited apparently to that derived from house wells. A company is now before Parliament for powers to supply the place, and are, as a matter of course, opposed by the Corporation, who never took a step to provide water until the company proposed to do so, and now want their scheme. The odd thing is, that the ratepayers object to a supply from either company or Corporation. The character of the water in the Beverley wells may be easily guessed, and there is no doubt that the town would be benefited by the introduction of a good supply; but the ratepayers say they will not have it. Like the Andover Guardians immortalized by Thackeray,

They join in one harmonious grunt:
"We wun't, we wun't, we wun't, we wun't."

A scarcity of water is beginning to be felt at Newcastle-on-Tyne, and it was at one time thought that it would be necessary to economize by striking off the night supply. Recent rains have for the moment removed the necessity, but we have a fear that it may recur. We are glad to see that the extension contemplated by the water company is regarded with favour in the Town Council. There is one characteristic of human nature which is always well represented in corporate bodies and Local Boards, and that is—selfishness. It is quite natural that the wants of Newcastle should be the first consideration in the Town Council, but we are pleased to see that, if these be sufficiently provided for, there is not likely to be any opposition to the supply of Tynemouth.

The water supply of the Corporation of Hull is still unsatisfactory, and, as far as we are able to judge, seems likely to remain so for some time to come. The Water-Works Committee hesitate to go to the expense of the engine power which they are told is necessary to place the supply from the wells beyond risk, and public opinion in Hull does not seem to force them on.

The Local Board of Balsall Heath, after having received a plan for the purification of their sewage by downward intermittent filtration, and visits from the supporters of various patent schemes, have determined to imitate the Corporation of Birmingham, and extend their works for purification with lime. At Derby the Town Council, having in view the prospect that in the course of a few years their sewage will be excluded from the river, are considering the propriety of adopting the earth-closet system. The

Town Council of Oxford cannot make up their minds as to how to dispose of their sewage. They are a little tempted by the example of the sewage farm at Banbury, close by, which does not work satisfactorily, either in a sanitary or a financial sense; but Local Boards have now come to the conclusion that they cannot expect to make a profit out of sewage, however it may be treated. The Coventry system (Dr. Anderson's patent) is also under consideration at Oxford, there being an evident desire to avoid irrigation if possible.

Dr. Carpenter, of Croydon, takes every opportunity of writing to *The Times* in favour of irrigation, and has recently obtained the insertion of another letter. As the writer would find it difficult to show that a sewage farm—at all events the Croydon farm—is profitable, his object is to prove that irrigation is not detrimental to health. Unhappily there are two opinions respecting this, but we are not going to dispute the accuracy of Dr. Carpenter's figures. There is, however, a curious sentence in the letter which deserves a word of notice. "The parish of Croydon in 1861," says Dr. Carpenter, "had a rateable value of £120,000; it has "now a net value in the poor-rate books of £369,378, or, in "other words, it has trebled in value since the sewage farm was "established."

What on earth has the sewage farm to do with the increased rateable value? Proximity to London, and abundant railway communication, have made the fortune of Croydon, which grew as fast as now when fever raged in the place, in consequence, it was said, of defective sewerage arrangements. "Sewage "farms," says Dr. Carpenter, "are health-producers, food-pro-"ducers, and rent-raisers;" but for all that they do not pay. West Derby has a sewage farm, and this is the last report concerning it—"The Main Sewerage Committee estimated that "during the ensuing year the sale of produce and stock from the "sewage farm would realize £3035. The amount which would "be required in 1874-5 for the repayment of loans was £3603, "and for cultivating, cropping, and applying sewage, £2356, or a "total of £5960 7s. 2d. Deducting the probable value of the "crops, the net estimate for the farm [in other words, the loss on "it to be made good from the rates] would be £2925."

## A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

### XVII.

We pass on to the gas-producing power of various coals. It has been said (*ante*, p. 688) that the amount of illuminating gas, and also the illuminating power, depends mainly on the proportion of hydrogen contained in the coal. In what state of combination hydrogen exists in coal is, at present, unknown; but, whatever the compound or compounds may be, we know that under the influence of heat they break up to form the gaseous combinations of carbon and hydrogen which give luminosity to a gas flame, and always free hydrogen. It is to the large proportion of hydrogen present in cannels that these coals owe their pre-eminence as gas producers. Boghead, for example, contains from 8 to 10 per cent. of hydrogen, while good samples of other cannels will have from 6 to 8 per cent. We are also in perfect ignorance as to the state in which oxygen is present in coal. But here, again, we are certain that the amount must influence the quantity of the non-illuminating ingredient, carbonic oxide, and also the production of the impurity, carbonic acid, which has to be removed. It may be taken as more certain still that the production of oxygenated compounds in tar (*e.g.*, carbolic and cresylic acid) is controlled by the amount of oxygen in the coal. We must, therefore, regret that ultimate analyses of gas coals are not more frequently made, for, in our opinion, they would constitute useful guides in the selection of coals.

The tables which follow comprise the results of workings published from time to time in the JOURNAL OF GAS LIGHTING and various other publications. Their value, it must be confessed, is not great. The yield of gas is the most important result stated, and this, as all well know, is mainly dependent on the heat employed in distillation, of which we only make approximative guesses. The illuminating power of the gas produced, as given in the tables, is of little value without a knowledge of the burner employed in its determination. The value of the specific gravity and absorption by bromine tests, as indications of the quality of gas, will be discussed further on; but it may here be pointed out that neither is of importance. We see in the tables one gas having the specific gravity 752, with an illuminating power of 37·75 candles; while another, with a specific gravity of only 644, has the illuminating power of 41·76 candles. Wider divergences from a supposed truth appear when we consider the bromine test as an indication of quality. In the experiments of Mr. Evans recorded below we see one gas, having only 20 per cent. of condensable hydrocarbons, possessing an illuminating power of 40 candles; while another, showing an absorption of 40 per cent., gives the light of only 17·00 candles. The causes of these discrepancies will be fully entered upon in another chapter. We only point out the apparent contradictions here in order that the reader may not be deceived in the conclusions he draws from the results tabulated.

COAL AND CANNEL.

| Name of Coal. | Cubic Feet of Gas Obtained per Ton | Illum. Power of Gas in Stand. Sperm Cndls. | Specific Grav. of the Gas. Air, 1·000 | Wght. of Coke in lbs. per Ton. | Ash in Coke per Cent. | Authority. |
|---|---|---|---|---|---|---|
| CANNEL COAL. | | | | | | |
| Arniston | 12,600 | 22·5 | ·626 | 1221 | 7·66 | Chartered Gas Co. |
| Boghead | 13,334 | 45· | .. | 717 | .. | Mr. T. G. Barlow. |
| Ditto | 15,000 | 37·75 | ·752 | 708 | 72·15 | Chartered Gas Co. |
| Capeldrae | 14,400 | 19·75 | ·577 | 1019 | 23·07 | Ditto. |
| Ditto | 11,500 | 41·56 | ·644 | 999 | 17·26 | Dr. Fyfe. |
| Chapelside, Airdrie | 11,272 | 35·61 | .. | 916 | 19·06 | Dr. Wallace, 1869. |
| Dunkirk, Dukinfield | 10,875 | 22·75 | .. | 1568 | 3· | Mr. Longworth. |
| Edge Green, Wigan District | 10,540 | 19 63 | .. | 1348 | 7·83 | Mr. J. Paterson. |
| Fir Tree, ditto | 11,900 | 15·75 | .. | 1210 | 13·7 | Ditto. |
| Haywood, Scotch | 11,400 | 30·22 | .. | 1157 | 17·8 | Mr. F. J. Evans. |
| Hindley Field | 12,890 | 23·25 | .. | 1053 | 7·4 | Mr. J. Paterson. |
| Kirkness | 12,800 | 21·2 | ·562 | 896 | 33·7 | Chartered Gas Co. |
| Knightswood | 9,720 | .. | ·590 | .. | .. | Mr. Wright. |
| Ditto | 13,200 | 19· | ·550 | 1154 | 4·66 | Chartered Gas Co. |
| Lawton, Stoke-upon-Trent | 8,000 | 22· | .. | .. | 72· | Mr. J. Paterson. |
| Lesmahago, No. 1 cannel | 13,500 | 27·1 | ·642 | 1129 | 18·05 | Chartered Gas Co. |
| Ditto | 12,750 | 35·55 | .. | 1052 | 10·85 | Mr. F. J. Evans, 1868. |
| Ditto | 11,500 | 34·5 | .. | 1081 | 11·17 | Professor Penny, 1869. |
| Leverson | 11,600 | 18· | ·523 | 1550 | 13·51 | Chartered Gas Co. |
| Lochgelly | 9,123 | .. | ·567 | 1490 | 19·7 | Dr. Fyfe. |
| Lothian | 10,000 | .. | ·556 | .. | .. | Ditto. |
| New Brunswick | .. | .. | .. | 755 | 1·78 | Mr. L. Thompson. |
| Pelton | 11,500 | 18·5 | ·520 | 1534 | 13·72 | Mr. J. Hedley. |
| Ramsey | 10,300 | 21·4 | ·548 | .. | .. | Chartered Gas Co. |
| Ramsey's Newcastle | 9,746 | .. | ·554to ·580 | .. | .. | Dr. Fyfe. |
| Ditto | 9,151 | 27·2 | .. | 1416 | 10·44 | Mr. L. Thompson. |
| Scotch Parrot | 9,500 | .. | ·640 | .. | .. | Dr. Fyfe. |
| Scotch | 14,000 | .. | ·580 | .. | .. | Mr. Clegg. |
| Staffordshire | .. | .. | .. | 1120 | 5·8 | Mr. L. Thompson. |
| Wemyss | 10,976 | .. | ·670 | .. | .. | Mr. Wright. |
| Ditto | 10,192 | .. | ·691 | .. | .. | Ditto. |
| Ditto | 14,300 | 24·5 | ·580 | 1064 | 31·78 | Mr. Evans, Chartd. Co. |
| Wigan, Ince Hall | 11,673 | .. | ·620 | 1474 | .. | Mr. J. Leigh. |
| Ditto, ditto | 11,400 | 20· | ·528 | 1411 | 4·76 | Mr. Evans, Chartd. Co. |
| Ditto, Balcarres's | 11,500 | .. | .. | .. | .. | Mr. J. Leigh. |
| Ditto, Kay and Dewsbury's | 11,300 | .. | .. | .. | .. | Ditto. |
| Ditto, Rosebridge | 11,125 | 22·63 | .. | 1414 | 5· | Mr. J. Paterson. |
| Yorkshire, West Iron and Coal Co., West Ardsley, near Leeds | 10,296 | 21· | .. | 1344 | .. | Mr. W. Hugon. |
| NEWCASTLE COALS. | | | | | | |
| Dean's Primrose | 10,500 | .. | ·430 | 1585 | 3·4 | Mr. L. Thompson. |
| Ditto | 10,500 | 12· | ·430 | .. | .. | Mr. Evans, Chartd. Co. |
| Felling Main | 11,200 | .. | ·410 | .. | .. | Mr. Clegg. |
| Garesfield | 10,500 | .. | ·398 | .. | .. | Mr. L. Thompson. |
| Ditto, Bute's | .. | .. | .. | 1606 | 4·46 | Ditto. |
| Ditto, Cowan's | .. | .. | .. | 1581 | 1·34 | Ditto. |
| Ditto | 10,500 | 11·5 | ·398 | .. | .. | Mr. Evans, Chartd. Co. |
| Hutton Seam | 8,700 | .. | .. | .. | .. | Hartlepool Gas Co. |
| Leverson's Wallsend | 10,800 | .. | ·425 | 1458 | 7·82 | Mr. L. Thompson. |
| Ditto | 10,800 | 12·5 | ·425 | .. | .. | Mr. Evans, Chartd. Co. |
| New Pelton | 10,500 | 12· | ·415 | 1564 | 2·5 | Mr. L. Thompson. |
| Peareth's Wallsend | 11,147 | .. | ·410 | .. | .. | Mr. Clegg. |
| Pelton | 11,000 | 14· | ·430 | .. | .. | Mr. Evans, Chartd. Co. |
| Pelaw | 11,424 | .. | ·444 | .. | .. | Mr. J. Hedley. |
| Ditto | 11,000 | 12·75 | ·420 | .. | .. | Mr. Evans, Chartd. Co. |
| Pelaw Main | 12,400 | .. | ·420 | 1561 | 3·73 | Mr. Clegg. |
| Russell's Wallsend | 12,000 | .. | ·418 | .. | .. | Ditto. |
| South Pelaw | 9,000 | 12·5 | .. | .. | .. | Rochester Gas Co. |
| Washington | 10,000 | 14· | ·430 | 1540 | 3·2 | Mr. L. Thompson. |
| West Hartley | 10,500 | 12·5 | ·420 | 1438 | 7·3 | Ditto. |
| CUMBERLAND, YORKSHIRE, LANCASHIRE, DERBYSHIRE, STAFFORDSHIRE, WELSH, AND OTHER KINDS OF COAL. | | | | | | |
| Albert Gas Coal, Newbold, Chesterfield | 10,375 | 14·13 | ·488 | 1402 | 3·72 | Mr. J. Paterson. |
| Anderton Hall, Arley Nuts, Wigan | 11,500 | 14·8 | ·400 | 1485 | 2·33 | Ditto. |
| Arley | 10,200 | 13· | ·462 | 1540 | 6· | Mr. J. E. Clift. |
| Barley Brook, Arley, Wigan | 9,500 | 16·7 | ·460 | 1459 | 4·59 | Mr. Alfred King. |
| Bickerstaff, Liverpool | 11,424 | .. | ·475 | .. | .. | Mr. J. Hedley. |
| Bilston | 7,100 | 9·5 | .. | .. | .. | Bilston Gas Co. |
| Blackleyhurst Little Delph, St. Helens | 9,725 | 13·81 | ·400 | 1470 | 2·75 | Mr. J. Paterson. |
| Brancepeth | 8,560 | 13· | .. | .. | .. | Harrogate Gas Co. |
| Brymbo, 2-yard coal | 8,800 | .. | ·463 | .. | .. | Mr. Wright. |
| Ditto, main | 10,500 | 15· | ·540 | .. | .. | Mr. L. Thompson. |
| Bryn Hall, hard coal | 9,540 | 15·28 | ·511 | 1377 | 5·64 | Mr. J. Paterson. |
| Ditto, gas coal | 10,800 | 16·14 | ·458 | 1324 | 5·5 | Ditto. |
| Clifton Hall, Stockport | 10,730 | 17·3 | ·575 | 1464 | 3·33 | Mr. J. Paterson. |
| Cumberland | .. | .. | .. | 1669 | 2·81 | Mr. L. Thompson. |
| Derbyshire | 8,000 | 13· | .. | .. | .. | Leamington Gas Co. |
| Ditto | 8,500 | 13· | .. | .. | .. | Leicester Gas Co. |
| Ditto, Staveley | 9,400 | .. | ·424 | .. | .. | Mr. Wright. |
| Ditto, soft coal | 7,000 | .. | ·448 | .. | .. | Derby Gas Co. |
| Ditto, ditto | 7,000 | .. | ·424 | .. | .. | Nottingham Gas Co. |
| Durham Fields, best seam | 8,600 | 12· | .. | .. | .. | Sunderland Gas Co. |
| Dutton Middle Mountain Mine, Upholland, Wigan | 10,055 | 17·26 | ·513 | 1470 | 1·73 | Mr. J. Paterson. |
| Forest of Dean | 10,133 | .. | ·350 | .. | .. | Mr. Clegg. |
| Ditto | 9,000 | 8 to 9 | .. | .. | .. | Gloucester Gas Co. |
| Garswood Hall top coal, Wigan | 10,820 | 16· | ·566 | 1346 | 5·79 | Mr. J. Paterson. |
| Garswood Little Delph, St. Helens | 9,000 | 14·74 | ·417 | 1419 | 3· | Ditto. |
| Haddock Little Delph, St. Helens | 8,936 | 12·75 | .. | 1398 | 3·03 | Ditto. |
| Hindley Field best coal | 10,760 | 15·26 | ·450 | 1314 | 5·45 | Ditto. |
| Hindley Green, Arley Mine | 11,200 | 15·11 | ·452 | 1435 | 2·28 | Ditto. |
| Ditto, 5-feet | 9,470 | 13·35 | ·479 | 1315 | 3·21 | Ditto. |
| Neath, South Wales | 11,200 | .. | ·468 | .. | .. | Mr. J. Hedley. |
| New Winning Orrell 4-feet, Wigan | 10,975 | 16·97 | ·469 | 1464 | 4·33 | Mr. J. Paterson. |
| Ditto, ditto, 5-feet | 11,800 | 13·92 | ·481 | 1461 | 5·88 | Ditto. |
| Ditto, Wigan, 4-feet | 10,150 | 14·63 | ·489 | 1400 | 6·13 | Ditto. |
| Ditto, King coal tops, Wigan | 10,300 | 14·53 | ·487 | 1460 | 5·22 | Ditto. |
| Ditto, ditto, bottoms, ditto | 10,000 | 14·48 | ·477 | 1431 | 5·33 | Ditto. |
| Peasley Cross Little Delph | 9,000 | 12·5 | ·411 | 1425 | 4·75 | Ditto. |
| Platt Lane coal | 9,750 | 13·75 | ·483 | 1412 | 2·94 | Ditto. |
| Rose Brdg. Arley Mine, Wgn. | 12,600 | 15·4 | ·445 | 1493 | 1·71 | Ditto. |
| Ditto, deep yard coal, Wigan | 10,300 | 15·22 | ·444 | 1315 | 2·73 | Ditto. |
| Shirland gas cl., nr. Alfreton | 11,000 | 13·46 | .. | 1312 | 1·85 | Ditto. |
| Ditto, Tipton do., nr. Alfrtn. | 9,800 | 16·22 | ·500 | 1402 | 1·77 | Ditto. |
| Spring Colliery, Wigan, the yard coal | 10,450 | 13·31 | ·477 | 1456 | 3·62 | Ditto. |
| Ditto, smith coal, ditto | 9,800 | 15·22 | ·494 | 1463 | 2·11 | Ditto. |
| Staveley gas cl., up. portion | 9,040 | 11·52 | .. | 1395 | 4·32 | Ditto. |
| Ditto, lower portion | 10,100 | 12·23 | .. | 1340 | 4·5 | Ditto. |
| Stockport | 7,800 | .. | ·539 | .. | .. | Stockport Gas Co. |
| Swan Lane gas cl., Hindley | 9,400 | 16·82 | ·521 | 1314 | 2·42 | Mr. J. Paterson. |
| Syndal Hall bone cl., Wigan | 10,150 | 17·8 | ·542 | 1291 | 3·23 | Ditto. |
| Victoria Arley coal, Rainford | 10,030 | 13·63 | ·483 | 1264 | 2·88 | Ditto. |

| Name of Coal. | Cubic Feet of Gas Obtained per Ton. | Illum. Power of Gas in Stand. Sperm Cndls. | Specific Grav. of the Gas. Air, 1·000. | Wght. of Coke in lbs. per Ton. | Ash in Coke per Cent. | Authority. |
|---|---|---|---|---|---|---|
| Wales, Neath. | 11,200 | .. | ·468 | .. | .. | Mr. J. Hedley. |
| Welsh coal, 1st variety | 10,000 | .. | ·385 | .. | .. | Mr. Clegg. |
| Ditto, 2nd variety | 10,133 | .. | ·380 | .. | .. | Ditto. |
| Wilsontown gas coal | 10,538 | 33·2 | ·547 | 1216 | 11·86 | Dr. Wallace. |
| Wigan & S.Helens caking cl. | 9,168 | 16·25 | .. | .. | .. | Mr. J. Paterson. |
| Yorkshire, best South | 9,000 | 14· | .. | .. | .. | Sheffield Gas Co. |
| Ditto, Renishaw | 10,860 | 16·38 | .. | .. | .. | Mr. Keates, 1874. |
| Ditto, Silkstone | 8,600 | 13·3 | .. | .. | .. | Great Grimsby Gas Co. |
| Ditto, Silkstone fall coal, Barnsley. | 11,290 | 16·98 | .. | 1443 | ·81 | Mr. J. Paterson. |
| Ditto, Silkstone fall best, Thorncliffe | 11,200 | 17· | ·476 | 1431 | 1·8 | Ditto. |
| Ditto, Silkstone, top bed | 11,670 | 15·17 | ·440 | 1395 | 2· | Ditto. |
| **Mixtures of Cannel and Coal.** | | | | | | |
| *Proportions specified.* | | | | | | |
| Boghead cannel 1-4th, Pelton coal 3-4ths | 12,800 | .. | .. | .. | .. | Mr. T. G. Barlow. |
| Boghead cannel 1-10th, Lochgelly cannel 9-10ths | 9,055 | 24·93 | .. | .. | .. | Ditto. |
| Ince Hall cannel 68 p. cent., Arley coal slack 32 p. cent. | 10,206 | 19·01 | ·527 | 1396 | 6·4 | Rossendale Union Gas Co. |
| Lesmahago cannel 6 p. cent., Cumberland coal 94 p. ct. | 7,000 | 15· | .. | .. | .. | Carlisle Gas Co. |
| Wigan Coal and Iron Co.'s cannel 72 per cent., Arley coal slack 28 per cent. | 9,967 | 19·65 | ·530 | 1462 | 5·2 | [Co. Rossendale Union Gas |
| Cannel & Nwestle. coal 1 to 5 | 9,000 | 14· | .. | .. | .. | Alliance G. Co., Dublin |
| Half cannel, half coal | 9,450 | 13·5 | .. | .. | .. | St. Helens Gas Co. |
| **Mixtures of Different Coals.** | | | | | | |
| Coal-Pit Heath, Forest of Dean and South Wales | 7,000 | 13· | .. | .. | .. | Bristol Gas Co. |
| Derbysh. & Staffordsh. coal | 8,500 | 10 to 12 | .. | .. | .. | Warwick Gas Co. |
| Derbysh., Nottinghamsh., and Yorkshire best coal | 7,800 to 8200 | 12 to 15 | .. | .. | .. | Nottingham Gas Co. |
| Derbysh. & Frst. of Dean cl. | 9,000 | 10· | .. | .. | .. | Cheltenham Gas Co. |
| New Pelton and other Newcastle coals | 8,500 | 13· | .. | .. | .. | Kingston-on-Thames Gas Co. |
| Ravensworth Pelaw and Newcastle coals | 9,000 | 13· | .. | .. | .. | Beccles Gas Co. |
| Silkstone and Renshaw coal | 7,500 | 11·5 | .. | .. | .. | Lincoln Gas Co. |
| Staffordsh. & Derbysh. coal | 8,800 | 12·5 | .. | .. | .. | Birmingham Gas Co. |
| **Mixtures of Coal and other Substances.** | | | | | | |
| Llantwit small coal, with 5 p. c. of Broxbrne. shale oil | 9,750 | 21·5 | .. | .. | .. | Mr. T. G. Barlow. |
| Newcastle coal 80 per cent., Trinidad bitumen 20 p. ct. | 10,600 | 17·6 | .. | .. | .. | Dr. Letheby and Mr. Keates. |
| Newcastle coal 90 per cent., Trinidad bitumen 10 p. ct. | 10,200 | 15·6 | .. | .. | .. | Ditto, ditto. |
| New Brunswick Albertite | 9,166 to 10,200 | 28·66 to 35·42 | .. | .. | .. | Mr. Evans. |
| Ditto | 8,400 | 40· | .. | 840 | .. | Ditto. |

The following analyses, published for the first time, have been kindly furnished by the authorities named :—

Recent Analyses of Coals and Cannels.

| Name of Coal. | Gas. Gas per Ton of Coals. Cub. Ft. | Gas. Illuminating Power. Cand. | Gas. Absorp by Bromine. Per Ct. | Gas. Carbonic Oxide. Per Ct. | Coke. Per Ton of Coals. lbs. | Coke. Ash in Coke. P. Ct. | Authority. |
|---|---|---|---|---|---|---|---|
| **Cannels.** | | | | | | | |
| Boghead | 13,000 | 40·00 | 25·0 | 1·5 | 670 | 60·0 | Mr. F.J.Evans |
| Lesmahago | 12,000 | 32·00 | 14·0 | 3·0 | 980 | 7·0 | Do. |
| Lothian cannel | 12,700 | 34·00 | 17·0 | 7·0 | 963 | 6·0 | Do. |
| Clough cannel | 12,000 | 30·00 | 7·75 | 10·5 | 1,182 | 12·8 | Do. |
| Lochgelly | 10,500 | 17·00 | 40·00 | 6·0 | 1,232 | 15·0 | Do. |
| Ince Hall (Wigan) | 10,200 | 20·00 | 12 00 | 3·5 | 1,120 | 8·0 | Do. |
| Wigan | 10,000 | 20·00 | 13·00 | 4·2 | 1,120 | 6·5 | Do. |
| Kirkless Hall | 10,500 | 23·00 | 14·00 | 4 0 | 1,232 | 9·5 | Do. |
| Leeswood Curley | 10,000 | 28·00 | 24·00 | 3·0 | 728 | 10·0 | Do. |
| Do. average | 9,800 | 20·0 | 12·50 | 8·0 | 1,120 | 8·0 | Do. |
| Wemyss | 11,000 | 26·0 | 17·00 | 1·0 | 1,344 | 50·0 | Do. |
| **Various Coals.** | | | | | | | |
| Pelton (Old) | 11,500 | 13·5 | 5·0 | 5·0 | 1,560 | 2·75 | Do. |
| Pelton (New) | 10,500 | 12·0 | 4·75 | 4·5 | 1,568 | 2·50 | Do. |
| Pelaw | 10,000 | 13·25 | 4·5 | 4·5 | 1,568 | 2·50 | Do. |
| Waldridge | 9,000 | 13·00 | 4·3 | 3·5 | 1,568 | 3·00 | Do. |
| Wearmouth | 10,500 | 13·50 | 4·7 | 3·8 | 1,500 | 2·50 | Do. |
| Bute's Tanfield | 10,100 | 13·50 | 4·0 | 3·7 | 1,450 | 3·80 | Do. |
| Dean's Primrose | 10,500 | 13·50 | 5·0 | 4·7 | 1,400 | 3·50 | Do. |
| South Hetton | 9,600 | 12·70 | 3·0 | 3·2 | 1,470 | 3·70 | Do. |
| Shincliffe | 9,500 | 12·0 | 5·0 | 2·0 | 1,500 | 3·80 | Do. |
| Lambton | 10,500 | 14·0 | 4·3 | 3·3 | 1,560 | 2·80 | Do. |
| Haswell | 10,300 | 13·0 | 3·4 | 3·1 | 1,300 | 2·50 | Do. |
| Silkstone (Three Samples) | 10,400 | 15·64 | 6·25 | 6·25 | 1,366 | 3·00 | Do. |
| Do. | 10,866 | 15·84 | 6·5 | 6·25 | 1,377 | 2·00 | Do. |
| Do. | 10,800 | 15·65 | 4·75 | 7·00 | 1,480 | 6·10 | Do. |
| Thorncliffe | 10,500 | 16·50 | 5·5 | 6·50 | 1,433 | 4·80 | Do. |
| Rhos Lantwit, Caerphilly | 9,730 | 15·07 | 7·30 | 8·20 | .. | .. | Mr. Fiddes |
| Do., do. | 9,675 | 13·69 | 4·55 | 7·30 | .. | .. | Bristol. |
| Powell's Lantwit, large | 11,079 | 15·16 | 6·05 | 10·10 | .. | .. | Do. |
| Do., small | 10,285 | 14·56 | 5·00 | 8·60 | .. | .. | Do. |
| Lydney — Norchard Coal. | | | | | | | |
| Coleford high delf seam | 9,215 | 15·46 | 4·75 | 10·30 | .. | .. | Do. |
| Do. do. | 8,702 | 14·13 | 4·25 | 9·40 | .. | .. | Do. |
| Cannel — Vartez Hill Colliery, Pontypool | 9,262 | 17·21 | 6·20 | 3·60 | .. | .. | Do. |
| Gas coal from do. | 9,021 | 15·47 | 5·80 | 4·90 | .. | .. | Do. |
| Tyr Flikens, Newport, Mon. | 11,835 | 13·60 | 4·30 | 5·90 | .. | .. | Do. |
| Lydney — Tranchard seam | 9,870 | 14·77 | 5·45 | 8·60 | .. | .. | Do. |
| Pellowell, near Lydney | 9,785 | 13·84 | 4·25 | 10·15 | .. | .. | Do. |
| Lantwit red ash. Pontypridd small coal | 9,390 | 15·06 | 5·80 | 8·90 | .. | .. | Do. |
| Do. large | 9,708 | 16·33 | 6·46 | 8·33 | .. | .. | Do. |
| Dean's Primrose | 9,800 | 16·00 | .. | .. | .. | .. | Mr. G. |
| Holmside | 9,800 | 16·00 | .. | .. | .. | .. | Livesey. |
| West Leversons | 9,464 | 15·50 | .. | .. | .. | .. | Do. |
| Towaley | 9,200 | 15·30 | .. | .. | .. | .. | Do. |
| Washington | 9,200 | 16·00 | .. | .. | .. | .. | Do. |
| Nettlesworth Primrose | 9,500 | .. | .. | .. | .. | .. | Do. |
| West Pelaw | 9,537 | .. | .. | .. | .. | .. | Do. |
| Norfolk Silkstone | 10,000 | 17·50 | .. | .. | .. | .. | Do. |
| Teesdale | 9,468 | .. | .. | .. | .. | .. | Do. |

## Communicated Article.

### THE CONDENSER OF MM. PÉLOUZE AND AUDOUIN.

(FROM OUR PARIS CORRESPONDENT.)

The trials which have been made at the works of the Parisian Gas Company, in regard to the value of the condensing apparatus of MM. Pélouze and Audouin, which have extended over several months, at last give me the opportunity of expressing a decided opinion on the efficiency of the arrangement.

Comparatively slight modifications have been made in the apparatus described in your JOURNAL of Oct. 7, 1873. It appeared that the liquid was driven out of the hydraulic seal, G, by the movement of the gas traversing the small apertures of the apparatus; consequently, there was placed at the top of the opening a ring-formed band of metal, which prevented the outward passage of the tar which now constitutes a hydraulic joint. During summer time the upper part of the apparatus, A, was covered with a metallic plate, so as to limit the action of the bell, which permits a more easy regulation of the condenser under the circumstances of less production of gas during the summer time.

It has been found at the gas-works of St. Mandé, with an apparatus of 100,000 cubic mètre power daily, that the following results were arrived at :—

*January.*—Total production of gas, 90,000 cubic mètres (3,178,492 feet) per day; condensed tar equalled 1 litre per 1000 cubic mètres of gas (or 0·22 gallon) per 35,316 cubic feet. The ammoniacal liquor amounted to 0·50 litre (0·11 gallon), having a specific gravity of 7·9° Beaumé.

The analysis of the ammonia taken at the entrance of the apparatus gave a mean of 2·21 grammes per cubic mètre; at the exit one of 1·67 grammes. Consequently the amount of ammonia condensed by the apparatus gave a mean of 0·54 gramme per cubic mètre.

*May.*—Production of gas, 36,000 cubic mètres (1,271,400 cubic feet) daily; tar condensed amounted to 2 litres (0·44 gallon) daily per 1000 cubic mètres.

At the works at Ternes the following results were arrived at :—

*May.*—Production of gas, 40,000 cubic mètres (1,412,663 cubic feet) daily; tar condensed was 4 litres (0·88 gallon) per 1000 cubic mètres of gas; the ammoniacal liquor amounted to 1 litre (0·22 gallon), having a specific gravity of 6° Beaumé.

These experiments prove, in the most satisfactory manner, that the condensation of the tar is made very completely, whether in regard to quantity or all seasons of the year, by the use of the condenser of MM. Pélouze and Audouin. But the condensation of the ammonia is not equally complete. The first experiments, which were conducted during the summer, showed that the gas only lost in this apparatus from 30 to 40 per cent. of its ammonia, consequently MM. Pélouze and Audouin sought to improve the arrangement by adding an apparatus, patented in January, 1874, of which the following is a detailed description :—

*A New Method of removing Soluble Matters in Gas and Vapours by the Reaction of Dissolving Liquids dispersed through the Gases, &c., in the form of "Globular Spray."*

Nothing is more easy than the elimination of the larger number of soluble matters in gases, existing in a free state, or mixed with neutral gases, when the operation is performed in the laboratory or on small quantities of such gases.

But the same facility does not exist in industrial operations when we have to operate on large quantities of gases containing comparatively small quantities of the substances it is desired to remove from them. In certain cases difficulties arise in manufacture, especially in regard to the proportion of the quantity of the solvent employed, which, if injudiciously used, might diminish the illuminating power of the hydrocarbons, contained in the gas, by their solution in the liquid.

The apparatus employed practically for applying the solvent powers of liquids on gases which can be used to remove impurities, may be placed under the following two principal categories :—

*A.*—An arrangement by which the gas reduced into the form of a number of fine streams, or thin plate-like forms are applied to the liquids contained in special forms of apparatus, such as the scrubbers of Mallet, Barbottaners, Colladon, &c.

*B.*—A method by which the mixed gases come into contact with the solvent liquid spread on solid surfaces of coke, perforated surfaces, discs, &c., affording a large divided and porous surface.

Numerous other special contrivances of an ingenious nature have been suggested to give a uniform action of the liquid intended to act on the gases which have to be dissolved out, such as the form of cascades, fine jets, &c. Such combinations or arrangements give, in certain cases, relatively advantageous results, but they require considerable space, and have the inconvenience, independent of the expense, of requiring the use of a large quantity of liquid quite disproportionate to the results they effect. The liquid employed in such large quantities has, as we have already stated, another serious result, that of diminishing the illuminating power of the gas.

In using the process which is the object of our invention a most energetic action is obtained, attended with an absolute regularity of operation.

The liquid which it is proposed to use to act on the gas, or on mixtures of gases, is introduced in the form of fine spray, which thus comes into contact with the passing gas. The most intimate contact effected under these conditions exercises its power during the passage of the gas either to the distributing-pipes, or while the gas is remaining confined in vessels of a certain capacity.

The mist formed from the fine spray of the liquid cannot be removed except after a long passage, and, consequently, in a number of cases, produces serious inconvenience, unless MM. Pélouze and Audouin's apparatus is used as an auxiliary condenser.

The use of this apparatus, which in determining the shock or contact of the liquid globules among themselves, re-unites them in the form of a fine stream, and causes their condensation, affording thus a double advantage. Thus—

1. It completes the reaction in causing a more intimate mixture of the liquids held in suspension in the globular form, and of the soluble constituents contained in the gases or vapours.

2. The gases or vapours are thoroughly dried, they being entirely freed from extraneous moisture.

It may be added that the invention permits us to obtain an intimate contact between the molecules, provided only that exactly sufficient liquid is employed to produce the desired effect.

In certain special cases of gas-works the following forms of apparatus are employed:—

*A.*—The condensing apparatus of MM. Pélouze and Audouin is used to remove tarry matters contained in the gas before its passage into the chamber where the soluble matters are removed.

*B.*—The chamber in which the solution of such matters is effected by the intimate contact of the gases or vapours with the liquid which has been previously converted into a fine spray. The number of jets will vary with the extent of the works. One will suffice to give a permanent spray of 0·6 to 0·8 mètre in diameter, and of a height of from 3 to 4 mètres (say 10 to 13 feet) raising per hour about 10 litres (2·2 gallons) of liquids mixing with one cubic mètre of gas arriving under pressure.

*C.*—The condensing apparatus of MM. Pélouze and Audouin, intended to retain the dissolved liquids, such as water, ammoniacal liquor, saline solutions, &c., taken from the gas in a globular form.

*D.*—A reservoir containing the liquids got from the gas, as water, ammoniacal liquor, saline solutions, &c. This reservoir is fed by a pipe at its lower extremity. It receives the gas which enters and goes out at the upper part to reach the spray-producers. The pressure employed, which is from three to four atmospheres, acts at the same time on the liquid which passes to the spray-producers by a pipe placed parallel with the gas-pipe.

We learn that many trials, made with an experimental apparatus at the St. Mandé works, have given very interesting results, and will lead to the erection of one of a more practical character, of which I hope to give you a minute description at some future time.

MM. Pélouze and Audouin have already given in their first patent the hint that their condenser may be useful in other manufactures, beyond that of gas. In fact we have just seen that M. Maldart proposes to utilize it (*see* patent No. 101,083), to maintain the constant level of water in wet gas-meters. The "levelling condenser" of M. Maldart consists of a small reservoir, containing a series of partitions, pierced with little holes, which retain the water held in suspension by the gas, and return the liquid to the meter. This is thus obtained, without deranging or scarcely modifying the meter, and at trifling expense; at the same time a constant level of the water is maintained, and the prevention of any liquid being condensed in the distributing gas-pipes. In a recent communication to the Society of Civil Engineers, M. Maldart has given the following results of an experiment made with his small apparatus. Three gas-meters, of three gas-lights each, exactly the same in all respects, and levelled, were placed alongside each other, and the same gas passed through them before arriving at the point of combustion. The middle one alone was in contact with a levelling condenser. At the end of a month's work the water remained at its normal level in the middle meter, but in the other two it had sensibly lowered.

The consumption of the middle meter indicated 54 cubic mètres, the first was 52·8, and the third gave 51·6, showing in this case a loss of gas amounting to nearly 4 per cent. against the gas company. As about a decalitre (6·1 cubic inches) of water was sufficient to cause this difference in the measure of one three-light meter, it may be approximately concluded that the action of a levelling condenser is sufficient to withdraw in one month the water held in suspension by 54 cubic mètres of gas.

MM. Pélouze and Audouin have constructed a small apparatus for the same purpose, but they have found the greatest difficulty in condensing all the water without interfering with the pressure in the levelling condenser, and lowering the light-power of the gas.

The attempt to keep level the water in wet meters has given rise to a host of ingenious inventions. M. Rouget, of Brest, proposes for this purpose to make a communication, by means of a pipe, between the water reservoir of the meter and a chamber containing water placed beneath it. The gas passes first into the chamber, where it becomes saturated by the vapour of water before entering into the drum. It follows that the volume of water in which is placed the drum is not subject to reduction; it can only be increased by condensation, but the water thence resulting is carried to the lower chamber. If this invention answer the object of the inventor, there are still the grave objections of requiring serious alterations of existing meters, and of increasing the deposition of condensed liquids in the mains and supply-pipes.

## ON A NEW SYSTEM OF PHOTOMETRY FOR GAS—THE DIFFERENTIAL PHOTOMETER.

(Preliminary Notice.)

By Dr. Wallace, Gas Examiner for the City of Glasgow.

The results of an extensive series of experiments in which I have been engaged on the influence of pressure on the illuminating power of gas, some of which are published in a recent number of the Journal of Gas Lighting, have led me to propose a new system of photometry which promises to be useful, especially to practical gas makers. It is founded on the fact that, while gas of high illuminating power (say, 35 candles) suffers little or no diminution of photogenic power by being burned at a high, as compared with a low, pressure (1·5 inch as against ·5 inch), gas of low quality (say, 15 candles) gives only half the light at the high pressure that it does at the low. By burning the same gas, therefore, at the two ends of an ordinary photometer, the pressure at one end being regulated to ·5 inch, and at the other end to 1·5 inch, we have the means of deducing, by a single observation, the quality of the gas tested, provided always that a scale is previously prepared. That scale I have not yet constructed, but, from the observations I have already made with different qualities of gas, I think that 1 on the ordinary photometer bar will represent about 35 candles, and 2 about 15 candles. This, on the 100-inch bar, gives a range of 8½ inches, while the range on the bar from 15 to 35 candles is less than 6 inches. The delicacy of the test, therefore, will be at least equal to that obtained when candles are employed as the photometric standard.

The apparatus will consist of an ordinary 100-inch photometer, with gas jets at each end; and I employ a Bray's union jet No. 8 for the ·5-inch pressure, and No. 4 for the 1·5-inch pressure, the cloth stuffing being removed from both. In the centre is a wet double meter, working on the same spindle, supplying 5 cubic feet per hour to both jets, the necessary change of pressure being obtained by two balance governors. The initial pressure of the gas should be about 2 inches.

The principle I have pointed out affords an explanation of the fact that, while obstructed burners of various kinds show a very large increase of light with common, or 15-candle gas, amounting, in some cases, to nearly 100 per cent., with cannel gas of 25 to 26 candles they give an increase of only 20 or 30 per cent.

While working on various qualities of gas, I tried to obtain low qualities by mixing air with ordinary gas, but I found that the results were useless and misleading, the difference in illuminating power by employing a high pressure being immensely increased by the admixture of air. This explains the fact that air gas, made by mixing air with the vapour of petroleum spirit, must be burned at an excessively low pressure (·1 to ·2 inch) in order to obtain a satisfactory result.

# Correspondence.

## PRINCIPLE OF THE VALUATION OF GAS COAL.

Sir,—In the closing paragraph of my last contribution, I made an error. Would you be so kind as to insert the following correction? The sentence should read as follows:—

"But the cannel sold for 35s. during the depth of winter, which was 5s. more than its summer value, while the coal producing 10,665 cubic feet retained its present summer value of 20s, and

$$\frac{5s.}{111{\cdot}31 \text{ candles.}} = 0{\cdot}538 \text{ of a penny.}$$

So that the winter's value of this Yorkshire would be (0·538 + 0·24) = 0·778 of a penny per candle, multiplied by the difference in candles of the two coals = 26·5 candles, which would show that 1s. 10½d. would have to be deducted from the 16s. 8½d., leaving 14s. 10d. to represent the relative winter's value of this coal.

16s. 8½d. − (26·5 × 0·778d.) = 16s. 8½d. − 1s. 10½d. = 14s. 10d.

Showing a difference of value in these two coals equivalent to

20s. − 14s. 10d. = 5s. 2d."

D. A. Graham.

## LOW PRICE OF COKE AND LEAKAGE.

Sir,—In your Journal of the 2nd inst. is a letter from Mr. Methven, of Bury St. Edmund's, exhibiting apparently an intimate knowledge of the mains, &c., of the Cambridge Gas-Works. It is really not easy to see what could be the object of Mr. Methven.

Our chairman had simply called attention to the plain and undeniable commercial fact that, as a rule, it is impossible that residual products, especially coke, can be sold at rates corresponding with the prices of coals from which they arise.

Mr. Methven takes the opportunity of insinuating that the mains in Cambridge are so bad that a very large amount of coal is consumed more than is necessary.

He alludes to a brick main as still in use, which in fact has long since been a mere incident in the history of gas lighting, having been one of many experiments of that active-minded and well-remembered engineer, the late John Grafton, but which has been superseded years ago. The mainage of Cambridge is to a great extent comparatively new, and the services have been receiving a careful overhauling and replacing for years past. Wm. Wood, Manager.

*Cambridge University and Town Gaslight Company's Office, Sidney Street, June 4, 1874.*

## FOUL LIME AS LUTING.

Sir,—In answer to Mr. Forbes, I beg, through your columns, to inform him that foul lime, or, as it was then termed, "blue billy," was used at the Independent Gas-Works, London, under the management of Mr. Fulwood, in 1829, and I introduced it at our works in 1841, and it has been used exclusively since that time in lieu of loam.

*Gas-Works, Rochester, June 6, 1874.* Chas. Bird, Foreman.

Sir,—In answer to inquiries made by the Rev. G. H. Forbes, I beg to inform him the mixture of "refuse lime," to my own knowledge, has been used as *luting* for retort-lids and for *building* purposes nearly 20 years. Also that loam from the Trent, or other rivers, will be found a great saving, and easy of application in admixture of waste lime, &c., for luting.

*London, June 4, 1874.* R. K. Moorhouse.

Sir,—Permit me, through the columns of your invaluable Journal to, inform the Rev. Granville H. Forbes that foul or spent lime is used in the majority of gas-works throughout the United Kingdom as a lute for retort and other lids, and, as such, it has efficiently done its duty ever since the introduction of the process that gave it birth—namely, the purification of coal gas by lime. James Robb.

*Black Rock, Brighton, June 5.*

# Parliamentary Intelligence.

## HOUSE OF LORDS.

Monday, June 1, 1874.

The Lord Chancellor acquainted the House that the Standing Orders applicable to the Ulverston Local Board Bill have been complied with, and that no further Standing Orders are applicable to the Fylde Water, Horbury Local Board, Belfast Corporation Gas, and Chester Water Bills.

The Aberdare and Aberaman Gas, Hythe Improvement and Water, and Peterborough Gas Bills were read a second time, and committed.

The Tunbridge Wells Gas, and Gas and Water Orders Confirmation Bills were referred to a Select Committee, consisting of the Duke of Bedford (chairman), Earl Manvers, Lord Boyle, Lord Bolton, and Lord Kildare; to meet on Thursday, June 4.

Petitions were presented against the Horbury Local Board Bill from the Scotbill Upper Local Board: and against the Wakefield Water Bill from (1) Duke of Norfolk, (2) Duke of Effingham, (3) Earl Fitzwilliam, (4) Sir J. W. Copley, (5) Corporation of Doncaster, (6) Corporation of Sheffield, (7) Corporation of Rotherham, (8) Manchester, Sheffield, and Lincolnshire Railway Company, (9) Rawmarsh District Local Board, (10) Owners, &c., of mills, &c., on the Porter and on the river Dun, (11) Owners, &c., of steam-engines, &c., on the river Dun, (12) S. Fox and Company, Limited, (13) H. E. Russell.

TUESDAY, JUNE 2.

The Lord Chancellor acquainted the House that the further Standing Orders applicable to the Wakefield Water Bill have not been complied with. Examiners certificate was referred to the Standing Orders Committee on Monday, June 8.

The Grantham Gas Bill was read a second time, and committed.

The Airdrie and Coatbridge Water Bill was read a third time, and passed.

THURSDAY, JUNE 4.

The Lymm Water, and Peterborough Gas Bills were reported, with amendments.

The Fylde Water, Belfast Corporation Gas, and Chester Water Bills were read a second time, and committed.

The Skipton Local Board of Health Bill, brought from the Commons, was read a first time, and referred to the Examiners.

Petitions against the Tunbridge Wells Gas Bill were presented from (1) Landholders of Speldhurst, (2) inhabitants of Tunbridge Wells.

FRIDAY, JUNE 5.

The Alliance and Dublin Consumers Gas Bill was read the third time; amendments made; Bill passed, and sent to the Commons.

TUNBRIDGE WELLS GAS BILL.—Report from the Select Committee read—"That it is not expedient to proceed further with the Bill."

The Dublin Corporation Water, and Edinburgh and District Water Bills, brought from the Commons, were read a first time, and referred to the Examiners.

## HOUSE OF COMMONS.

MONDAY, JUNE 1, 1874.

The Dublin Corporation Water Bill, as amended, was considered; to be read the third time.

The Hartlepool Gas and Water, Middlesborough Extension and Improvement, Nottingham Water, and Ystrad Gas and Water Bills (Lords) were read a second time, and committed.

Reports, that no Standing Orders not previously inquired into are applicable to the Shipley Local Board of Health Bill (Lords), and that the Standing Orders not previously inquired into, and which are applicable thereto, have been complied with in the cases of the Westleigh, Pennington, and Bedford Local Boards, Broadstairs Water (No. 2), and Neath Corporation Bills (Lords), were laid upon the table.

SANITARY LAWS AMENDMENT BILL.—A Bill to amend and extend the Sanitary Laws was presented, and read a first time; to be read a second time on Monday, June 15.

Petitions against the Broadstairs Water (No. 2) Bill (Lords) were presented from (1) Broadstairs Water-Works Company, (2) Owners, lessees, and occupiers of Broadstairs; and against the Ystrad Gas and Water Bill (Lords) from James Harvey Insole.

TUESDAY, JUNE 2.

The Skipton Local Board of Health Bill was read the third time, and passed.

The Edinburgh and District and Water Bill, as amended, was considered; to be read the third time.

METROPOLIS GAS COMPANIES.—Accounts of the Metropolitan Gas Companies for 1873 were presented.

The Wrexham Water Bill (Lords) was referred to a Select Committee, consisting of Major Allen (chairman), Major Beaumont, Mr. Errington, and Mr. Egerton Hubbard; to meet on Wednesday, June 10,

THURSDAY, JUNE 4.

The Dublin Corporation Water Bill was read the third time, and passed.

The Belfast Corporation Water, and Dundee Water Bills, as amended, were considered; amendments made; Bills to be read the third time.

The Cupar Water Bill, as amended, was considered; to be read the third time.

METROPOLIS WATER SUPPLY, &C., BILL.—A petition in favour of this Bill was presented from the Society for the Encouragement of Arts, &c. Order for second reading on Friday, June 12, read and discharged:—Bill referred to the Examiners of Petitions for Private Bills, and leave given to sit and proceed forthwith.

Report, that no Standing Orders not previously inquired into are applicable to the Llanelly Gas Bill (Lords), laid upon the table.

FRIDAY, JUNE 5.

The Edinburgh and District Water Bill was read the third time, and passed.

THE GASLIGHT AND COKE COMPANY AND IMPERIAL GASLIGHT AND COKE COMPANY.—On the motion of Sir James Hogg, copies were ordered of the evidence before the commission appointed by the Board of Trade in 1873, on an application of The Gaslight and Coke Company, for a revision of the illuminating power and price of gas supplied by them. And of the like of the Imperial Gaslight and Coke Company in 1874, and of The Gaslight and Coke Company in 1874.

The Leeds Corporation Water, &c., Bill (Lords) was reported, with amendments.

## HOUSE OF LORDS.

THURSDAY, JUNE 4.

(*Before the Duke of* BEDFORD, *Chairman; Earl of* CORK *and Lord* BOYLE, *Earl* MANVERS, *Lord* KILDARE, *and Lord* BOLTON.)

### THE TUNBRIDGE WELLS GAS BILL.

Mr. RODWELL, Q.C., with Mr. MICHAEL and Mr. STEPHENS, appeared for the promoters; Sir EDMUND DENISON, Q.C., with Mr. MELVILLE, opposed on behalf of the Tunbridge Wells Local Board: and Serjeant SARGOOD, with Mr. WEBSTER, jun., opposed on behalf of Mr. John Heugh, one of the petitioners against the bill.

Mr. RODWELL opened the promoters case by stating that Mr. Heugh's opposition was altogether based on a misapprehension of the results likely to arise, because it would be an impossibility for the buildings to be seen from his house, his mansion being beyond the statutory limitation within which Parliament required notice to be given to owners; and that the opposition of the local board was mainly based on an intense desire to possess itself of the undertaking of the company, although it had been admitted on all sides that the company had faithfully discharged their duties to the town. And, further, he adverted to the fact that the local board had never taken the opinion of the ratepayers in any way, and were, therefore, really pursuing this opposition, not at their own cost or risk, not at the request of the ratepayers, but at the cost of Mr. Heugh, who, it was admitted, would pay the costs of the local board in opposing the bill. He objected to the *locus standi* of Mr. Heugh.

Sir EDMUND DENISON argued at some length in favour of Mr. Heugh's *locus standi*, and

The COMMITTEE decided that Mr. Heugh should be heard.

Mr. *John Read*, secretary and general manager to the Tunbridge Wells Gas Company, was then called, and repeated in detail his evidence which was given before the House of Commons.

Mr. *Robert Paulson Spice*, consulting engineer to the company, also repeated his evidence, and gave in detail his reasons for the necessity of an immediate removal of the works to another site; the advantages which the southern site possessed; the absolute impossibility, in his opinion, of any nuisance arising therefrom to the inhabitants of the town or to the owners of adjacent residences, and he produced a plan showing the proposed new buildings to be erected on the southern site, and intimated his readiness to accept a clause that no building thereon should exceed the height of 28 feet above the level of the present metals of the railway.

*Witness* was cross-examined by Mr. MELVILLE and Mr. WEBSTER particularly as to the injury likely to result to the foliage and timber surrounding the southern site, and expressed his very decided opinion that no such injury was ever likely to arise; and he illustrated this by quoting several instances in which excellent flower gardens were, to his knowledge, maintained on gas sites in different parts of the country.

FRIDAY, JUNE 5.

Mr. *Alfred Penny*, C.E., repeated his evidence, stating his reasons why the present gas-works should be removed to the southern and not to the northern site. He was certain no real injury was likely to accrue at all from the gas-works being erected in the southern valley; there might be a sentimental grievance. Gas-works could not injure foliage and trees—in fact, there was nothing that could possibly injure them. There would be no smoke and as little heat as possible escape through the chimney. When coke was quenched no doubt steam would arise, and if a person went close to it it would be offensive. But then it was distributed, and passed away into the air 100 yards from where the coke was being quenched. It was in the cleaning out of the purifiers that a bad smell was evolved, but that process could be carried on without any nuisance arising at all.

By Sir E. DENISON: It was a question of time with the present works. They might go on for a short time. A bill for gas-works in Victoria Park had been thrown out, but gas-works could not injure foliage. It was only a sentimental objection to the works being placed on that particular site in the south. There would be a difference between Tunbridge Wells gas stinks and London gas stinks, because of the size of the towns. What might be bearable on a small scale would be unbearable on a large scale.

Sir E. DENISON proposed asking witness a question with regard to the desirability of the northern site.

Mr. RODWELL objected, and said that the opposition had not referred to a particular site on the north as an alternative site.

Sir E. DENISON referred to clauses of the petitions presented by the local board, and said that while he should not say a word about transfer, both petitions distinctly stated that the northern site was the proper one. He wished to ask the witness if these allegations were true.

Mr. RODWELL would not mind that if Sir Edmund would promise not to pursue it further.

The CHAIRMAN: We do not wish to shut you out; but we should be glad not to hear more than is absolutely necessary.

Sir E. DENISON: After reading both petitions, do you say those allegations are true?

*Witness* said on the question of levels he took issue, the northern site not being so well suited. There was nothing in the nature of the surroundings that made it unsuitable, but the levels were not so good for the purpose of receiving materials. There was no difficulty, except the question of money. It would cost £3000 or £4000 to connect the works with the railway. When sewage stuff was removed out of tanks, stinks must exist.

By Serjeant SARGOOD: He did not believe the gas company would use the water they required out of the stream, nor was it probable they would put anything in it which would be inconvenient to fish.

Mr. *Jabez Church*, C.E. also repeated his evidence, and he being termed by Sir Edmund the "infallible Church," it caused considerable merriment.

Mr. *Edward Dunn*, surveyor of Tunbridge, produced and explained a number of sectional plans, which were referred to throughout the day, showing the sites and positions of the proposed and present gas-works.

Mr. *John Birch Paddon*, C.E., Mr. *Henry Finlay*, C.E., *and* Mr. *Ebenezer Goddard*, C.E., repeated their evidence, and gave fully their reasons why the southern site was most preferable for gas-works. Mr. *Homersham*, coal merchant, of Tunbridge Wells, proved that a great saving would be effected in the carriage of coals to the southern site. Mr. *George Langridge*, auctioneer, and Mr. *Thomas Ladds*, architect, both of Tunbridge Wells, and Mr. *Driver*, of London, were called to prove that there could not be, by any possibility, any depreciation of the land near the proposed southern site. The only fresh evidence adduced was the following:—

Mr. *Thomas William Keates*, consulting chemist to the Metropolitan Board of Works, &c., said that nuisances likely to arise from gas was a matter which was especially and peculiarly within his professional province. He had visited Tunbridge Wells for the purpose of this inquiry, and had seen the present and the proposed sites and the sewage farms, both north and south of the town. In his opinion there was no valid objection to the gas-works being placed on the southern site. Injury to residential property was certainly not likely to occur. He saw no objection to the works being placed on the southern site from a sanitary point of view; in fact, under no circumstances. Had never heard of gas-works being capable of producing any ill effects—just the reverse. Under some circumstances people were sent to the neighbourhood of gas-works for their health. In his opinion no effluvia from gas-works on the proposed site would be likely to reach and annoy any of the residents. There were houses in the neighbourhood of London—the Houses of Parliament, for instance, were considerably nearer the Chartered Gas-Works than houses in Tunbridge Wells would be to the proposed gas-works there. The gas-works there would also be in the open air. He did not think that gas-works carried on with proper care, and all the modern appliances used, need be a nuisance. Gas-works should not be a nuisance beyond their own walls. With the modern process of purification he believed that a person outside the walls of a gas-work would be utterly unable to detect anything of an unpleasant nature. He recollected, some years ago, an inquiry respecting the City of London works, when the question of nuisance and sanitary inconvenience was very largely examined into, and the issue was that there was no ground for the allegation that gas-works were a nuisance—certainly not in a sanitary sense—and the consequence was the gas company got their new charter. Knew gas-works where the manufacture of residual products was carried on without objection—Ipswich, Cheltenham, and at the Crystal Palace District Company's works they are most successfully carried out. The objections made by Mr. Heugh could not arise. It would be hardly possible to know what was going on in the Crystal Palace works even when inside the walls. These were very large works, consuming, he believed, 30,000 tons of coal, and produced, of course, a very large quantity of ammoniacal liquor. In 24 hours they would be working there something like 1000 gallons of gas liquor, whilst the yield in the proposed works, taking the quantity of coals used, would not be more than a sixth part of that. There could only be, therefore, one-sixth of the objection at Tunbridge Wells. Saw the sewage

tanks north and south. The sewage tanks at the south lay directly between the proposed works and the houses said to be likely to receive annoyance and injury. It seemed to him that the south-west wind they heard so much of would blow very nearly from the company's site over the sewage tanks. At the southern tanks he did not see any sewage matter out, but when he went to the north, he found the platform covered with sewage matter. This was a subject that came under his immediate notice. What he saw in the north should not, in his opinion, be allowed to exist. The plan was simply to allow the sewage of the town to run into tanks; there the semi-solid matter was thrown on a platform, and exposed to dry. During that drying process there was a most abominable stench coming from it. There was no disinfectant or precipitant beyond the falling down of the solid matter from the liquid. At the northern tanks a great quantity of this matter was lying on the platform to dry. It is taken out of the tanks in a semi-fluid condition, placed on a platform, and allowed to remain there until dry enough to remove. During that process fermentation was going on, and the stench was frightful.

By Sir E. DENISON: Sewage manufacture could be carried on in a much less offensive manner. Did not think a sewage farm properly managed need be a nuisance.

Sir E. DENISON: You say the City of London Gas-Works got their charter renewed 20 years ago. Now, since that time, have not several companies failed?

*Witness:* Not on the ground of nuisance. To begin with, I do not know that several have failed.

Sir E. DENISON: But surely you remember that, a few years ago, the Metropolitan Board and other people in London prevented some gas-works being established near Victoria Park?

*Witness:* Yes. In continuation, he said a similar thing took place at Fulham. It might be policy to put gas-works, as in this instance, outside towns; but, at the same time, he would not admit that that policy arose out of the idea that gas-works were injurious in a sanitary point of view. Knew the Chartered Gas Company was driven out of London some few years ago, but did not remember the prosecution of some residual works at Hackney. There were two kinds of residual products—ammoniacal liquor and tar. He should never himself advocate the working up of tar under such circumstances as these, and should strongly advise the Tunbridge Wells Company not to do it; but, as regarded the ammonia, he was strongly of opinion that there would be no difficulty whatever in manufacturing that without its being a nuisance.

Re-examined by Mr. STEPHENS: To remove the gas-works out of the town was exactly what the Tunbridge Wells Company were trying to do. He was quite certain that the works, as they now stood, should be removed. A sewage farm properly managed was no nuisance; but as to whether the Tunbridge Wells Sewage Farm was properly managed he did not like to express his opinion. All he could say was that, when he went to see the northern sewage tanks, they were a great nuisance to any house within a moderate distance. He could hardly say that it was a sample of good management on the part of the Tunbridge Wells Commissioners.

Mr. *Dupré*, chemical analyst, lecturer on chemistry at the Westminster Hospital, and chemical referee to the medical department of the Local Government Board, said he visited Tunbridge Wells in connexion with this inquiry, independently and on a different occasion to Mr. Keates. He saw both the present and proposed sites of the gas-works. Did not visit the present site, with a view of examining it. It was his business to consider questions such as in this case, whether any possible nuisance could arise from gas-works, and as lecturer on chemistry, &c., he considered himself well qualified to form an expression of opinion upon the point. He had heard the evidence Mr. Keates had given, and he quite concurred with it. Had visited the commissioners sewage-tanks at Tunbridge Wells. The system he saw in operation was just the same. The southern tanks were full, and none thrown out, but on the northern side the platform was covered with mud, and the stench was very offensive; there was no provision made to prevent any stench. It might be prevented, but there was no provision at all made there. The tanks were smaller at the south; at the north side, they were rather larger. The tanks were full at the south, but the same thing would occur there when they were emptied. The southern tanks were a very short distance from the site of the proposed gas-works.

Counsel declined to cross-examine.

Mr. *Paterson*, gas-works engineer at Cheltenham, said that at his works they had manufactured sulphate of ammonia for the last 14 years. Had houses of good class within a short distance of the works. Within 200 or 300 yards there were some very good houses, and the most influential part of the town was included in a radius of 1000 yards. During the time he had manufactured sulphate of ammonia, there had been no complaint whatever.

Counsel declined to cross-examine this witness also.

Mr. *Charles Adie*, auctioneer and valuer, of Tunbridge Wells, and a member of the Tunbridge Wells Local Board, also of the GAS Bill Committee to whom this bill was referred for consideration several months ago, said he was at the present moment engaged in building several good houses and shops within 20 yards of the existing gas-works. The population of Tunbridge Wells at the last census was 20,000, but since that time it had considerably increased. He had been of opinion that the town should have the gas-works, but he had changed his mind because of the enormous expense which would be incurred in the purchase by compulsory powers. The water-works were a loss to the town of several hundreds a year, though every year it was gradually decreasing.

*Witness* was cross-examined by Sir E. DENISON at considerable length with regard to reports, propositions, and amendments made at committee and general meetings of the Tunbridge Wells Local Board, with a view to show that the witness had been acting inconsistently; but the witness explained that, providing reasonable terms were made, he was still in favour of the town having the gas-works.

By the COMMITTEE: There were a number of houses being built in the northern valley by Mr. Weare, so that the same drawback would exist of first going up and then down a hill if they went to the southern site.

Messrs. *Langridge*, *Ladds*, and *Driver* having repeated their evidence, Mr. RODWELL said that closed the promoters case.

Sir E. DENISON said he was ready to open his case, but

The CHAIRMAN ordered the room to be cleared, and on the readmission of the public, in three or four minutes afterwards, said: I am directed by the committee to inform the promoters that we think it at present inexpedient to proceed any further.

The bill was therefore thrown out.

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## HOUSE OF COMMONS.

WEDNESDAY, MAY 20.

(*Before Mr.* BENYON, *Chairman; Mr.* FRESHFIELD, *Mr.* WILSON, *and Mr.* DAVIES.)

### EDINBURGH AND DISTRICT WATER BILL.

(*Continued from page* 766.)

Mr. DENISON, Q.C., Mr. RODWELL, Q.C., Mr. CLERK, Q.C., and Mr. POPE, Q.C., appeared for the promoters; Mr. VENABLES, Q.C., the Hon. GRANVILLE SOMERSET, Q.C., and Mr. SHIRESS WILL, Q.C., for the Mid-Lothian Water Company; Serjeant SARGOOD, with Mr. SHIRESS WILL, for ratepayers of Edinburgh; Mr. LITTLER, Q.C., and Mr. LOCH, Q.C., for Mr. W. J. L. GILMOUR; and Mr. R. CAMPBELL, for the Edinburgh and Leith Wine, Spirit, and Beer Trade Association.

Mr. *A. Harris*, deputy city clerk of Edinburgh, was recalled, and cross-examined by Mr. WILL at some length as to the proceedings of the corporation upon the reports of the engineers, &c.

Mr. *Colin James Mackenzie*, examined by Mr. POPE.

I am proprietor of the estate of Portmore, in the county of Peebles, and reside there. I am conversant with the county, and know the character of the water in Portmore Loch. It is a capital water. I know it thoroughly down as far as Arniston, but I am not so well acquainted with it as far down as Newbattle. The Gladhouse water is also a capital water. That of the Fullarton Burn is not so good. It is a little "peatish." There is a little moss in the Gladhouse water, but only in time of flood. It is an excellent water on the whole. I have examined the plans of the proposed scheme, and speaking as a proprietor in the district, and, therefore, interested in the scheme, it is, in my opinion, a well-devised scheme for the city of Edinburgh—certainly as to quality, and I take the reports of the engineers as the basis of my opinion as to quantity. As a landowner, my interests have been attended to, and so have those of some of my friends and neighbours. I have not petitioned for or against the bill, but, as far as my interests are concerned, I am an assenting party.

Cross-examined by Mr. WILL: I have an agreement with the promoters, which was made about a month ago. I know the site of the Gladhouse reservoir. There is ground covered with grass there; there may be peat, but there is none visible. There is peat on the top of the hills.

Mr. *W. H. Cameron*, examined by Mr. POPE.

I am treasurer and collector for the Edinburgh and District Water Trust, and was formerly connected with the old Edinburgh Water Company. I am, therefore, well acquainted with everything appertaining to the water supply of the city. When I was first appointed to the Trust I had charge of the distribution of water. During that time there were constant complaints of short supply. These complaints have continued up to the present time, especially in the summer months. In my judgment it is essentially necessary that an additional supply of water should be obtained from some source for Edinburgh, Leith, and Portobello? On the transfer of the company to the Water Trust in 1870, four inspectors were appointed for the purpose of checking waste, and it was found that so great were the advantages derived from the house-to-house visits, that other four were afterwards appointed. The trust also appoint an experienced officer to examine the new fittings. No new fittings were allowed to be put in without the sanction of that officer. The sum of £17,500 has been expended by the trust for new pipes to increase the supply to districts where it is most deficient. The result is that we can now supply the people of Edinburgh better than was done in 1870, especially in the summer, and that is done without any additional supply. The town is increasing, and we must look for some new source of supply to meet future wants. The seasons since 1871 have been favourable for water supply; the average has been 31 gallons per head. We cannot give constant service in summer, and the consequence is that at this season we have constant complaints. 1871 was a dry year, and we were unable to distribute half the ordinary quantity—only 13 gallons per head was distributed. The supply had to be regulated, and for 24 hours at a time certain districts were without water. There is a considerable quantity of water which runs to waste; and one of the objects of this bill is, by the construction of the Denscleuch reservoir, to prevent that waste. In 1870 we lost a large quantity of water through being unable to give compensation to the down streams. We are bound to supply the streams before we can bring a drop into Edinburgh from the Crawley reservoir. In order that we may keep up our statutory liability, the supply for domestic use sometimes drops off. It dropped off altogether one month from Crawley. By keeping the Crawley pipe full you only convey to Edinburgh as much water as the existing works are authorized and capable of carrying. The late water company, before their undertaking was conveyed to the trust, were much impressed with the necessity of obtaining a further supply. They had as many as six bills, as well as money bills, seeking powers of that character. The water company asked for an aggregate of 7 or 8 million gallons at a cost of £62,800 per million. The present bill proposes to double the supply at a cost of £40,000 per million gallons. We are, therefore, proceeding upon an economical basis, inasmuch as we obtain a larger supply for less money. If we do not get more water, we shall have great difficulty in supplying the present population. There are many houses of £20 rental, and even under, which have water-closets and baths. In 1867 the water company were looking about through their engineer to ascertain what new sources of supply were available, as they wished to get as much as would provide for an increased consumption for many years.

Mr. POPE: It has been suggested that the trustees might buy water instead of constructing works themselves. What is the general feeling on that question in Edinburgh?

*Witness:* I believe the general feeling is that we should have a bill of our own instead of buying from any private company whatever. We had quite enough to do with the old company. In fact, the inhabitants prefer to have works of their own instead of paying interest to private persons to construct works for them. That was the very object of placing the undertaking of the old company in the hands of the corporation.

Examination continued: It is not proposed in 1874-5 to make any alteration in the rates, but to borrow a sum of £39,900 to pay the expenses of the bill of 1871, the expenses of this bill, and the extension of piping. In 1875-6 a sum of £150,000 will be borrowed for new works. It is proposed still to keep the rates as at present, with the exception of putting on 1d. per pound as a public rate. In 1876-7 an additional sum of £100,000 will be borrowed for new works, and the domestic rate will be raised 1d., or from 7d. to 8d.; and there will be an increase of the shop rate of ½d., making it 2d. In 1877-8 a further sum of £100,000 will be borrowed, and another 1d. will be added to the domestic rate, making it 9d.; and the shop rate will be raised to 2½d., keeping the other rates as before. In 1878-9 a sum of £20,000 may be borrowed, and it is not proposed to make any alteration that year. In 1879-80 an additional sum of £10,000 may be borrowed, if necessary, and an increase of 1d. will be made in the domestic rate and of ½d. in the shop rate, making these rates respectively 10d. and 2½d. These operations will extend over six years. At the end of those six years the domestic rate will be raised 3d., the shop rate ¾d., and there will be an additional public rate of 1d. The latter is for sanitary purposes, such as watering the streets, &c.

Cross-examined by Serjeant SARGOOD: I have been the treasurer of the Water Trust since its origin. I was connected with the old water company for upwards of 30 years. In 1871 I was examined as a witness in behalf of the St. Mary's Loch Bill. I remember there was a report made by Mr. Leslie before that bill was launched. I do not recollect whether the amount of the estimate was £150,000 above that of the gentleman upon whose report we were proceeding. There was a great deal of opposition to that bill, and there was an interdict against the trustees. I consider it a hardship that trustees cannot promote a bill for additional water supply without incurring individual responsibility. In October, 1869, Bailie Lewis reported that the Moorfoot water was objectionable and peaty. I cannot say it was after that report the trustees unanimously approved of it.

Mr. WILL: Why is it that the clauses of the bill regarding waste have been struck out?

*Witness:* There was considerable opposition in the Town Council on the matter. The clauses were regarded as arbitrary, and it was thought advisable

that they should be struck out. The Town Council ordered it to be done accordingly. I cannot say when they were struck out.

Cross-examination continued: I have no doubt that water from the Moorfoot will be introduced into Edinburgh within three years from the passing of this bill. I think we can get double the quantity from this source than by making the manor water. We require double the quantity, which will be about 54 gallons per head of the present population. The estimate of cost which I have given includes management, distribution, filtration, taxes, repairs, sinking-fund, &c. The sinking-fund does not come into operation till seven years after the passing of the bill, and 1½d. per £1 of rental will suffice for that, and that rate will be gradually reduced year by year.

*Mr. R. Adam*, corporation accountant, corroborated the evidence of last witness; and Mr. *R. Paterson*, an architect, proved the great increase in the number of superior houses in Edinburgh during the last few years, and the necessity for an increased water supply. Formal evidence was also given as to the samples of water taken from the South Esk, and submitted for analysis.

Dr. *Lyon Playfair*, M.P., examined by Mr. POPE.

I am the representative in Parliament for the University of Edinburgh. Before my election I was professor of chemistry in that university. In June, 1863, I received instructions from the Town Council of Edinburgh to make an analysis of certain samples of water handed to me. They professed to have been collected by the late Mr. Benjamin Hall Blyth from the South Esk and Fullarton Burn. I handed in a report to the Town Council of my analysis. The water varied very much. The South Esk water was good. Its hardness was 5½ grains chalk per gallon. That is water nearly one-third the hardness of the London Thames water. The Fullarton Burn contained rather better water, its hardness being only 4½ grains.

Cross-examined by Mr. WILL: The Fullarton Burn water was rather superior to the South Esk; there was not much difference between them; but, on the whole, it was rather better. All the samples of the water were colourless, with the exception of the Fullarton water, which had a slight colouring matter in solution. That probably was peaty matter. I did not find considerable quantities of organic matter. In the Middleton Burn the quantity was considerable; but in the South Esk and the Fullarton Burn there were not large quantities.

Mr. *J. Leslie*, examined by Mr. CLERK.

I am a civil engineer, practising at Edinburgh. As early as 1865 and 1866 it appeared to me, acting for the water company, that the available springs for town use were nearly exhausted. I looked about for fresh sources of supply around Edinburgh, and I pitched upon the Moorfoot scheme as being the best in my opinion. I was instructed by the Water Trust to make surveys with a view of bringing that water into Edinburgh. In 1869 the three corporations of Edinburgh, Leith, and Portobello complained of the deficiency of the supply of water, and the scheme for obtaining a supply of water from the Moorfoot Hills fell into abeyance, public attention having been directed to getting water from St. Mary's Loch. In 1871 I was appointed engineer to the Water Trust, and I made a report upon the various schemes—six in number—which had been proposed for giving an additional supply of water to these towns. One of these schemes was the St. Mary's Loch. I had nothing to do with the preparation of the plans for bringing that water into Edinburgh. The bill passed the House of Commons in 1871, but was rejected by the Lords. I had no objection to the St. Mary's Loch water as being a sufficiently good water, but I considered that there was not sufficient storeage provided for giving an adequate amount of compensation. In all the inquiries which have taken place up to this time in Parliament, it has been admitted that an additional supply is essentially necessary. Since the opinion expressed by the committee of the House of Lords on the subject of the prevention of waste, a good deal has been done by the trustees to prevent waste. A good deal of inspection has been going on, and bad apparatus has been removed; but, with all the saving that has taken place, we would, in a dry season, be in a very awkward position, unless we can obtain an additional supply. The present maximum supply is barely equal to the demand, and if it falls short there are complaints directly. In 1870 the existing compensation reservoir was absolutely dry, and we had to discharge the whole of the Crawley spring into the stream, the whole of the water, about 2½ million gallons, being thus lost to the consumers. At the present time no power is exercised by anybody with regard to taking water from the South Esk. After the rejection of the St. Mary's Loch scheme in 1871, I again cast about for a source whence to obtain an additional supply. I found that in the Pentlands the water was very much scattered, and that though a supply could be obtained from that district, a considerable expense would have to be incurred in collecting it. The springs on the North Esk are already appropriated for the supply of Edinburgh. There is plenty of water in the Manor district, but I feel certain, from the amount of storeage provided by the Mid-Lothian Water Company, that they are not in a position to supply Edinburgh with the requisite quantity. The total catchment area of the Gladhouse reservoir is 6131 acres, of the Portmore Loch and Tweeddale Burn 1947, giving a total area of catchment for the supply of Edinburgh of 8078 acres. No part of the water of the Fullerton district is proposed to be taken for the town supply. The area of catchment of this district is 5917, and the water would go to compensate the landowners. The total yield, including compensation, per day of the 8078 acres will be 10,097,500. 2,504,500 gallons is to be provided as compensation, but of that quantity 290,000 gallons are to be provided from the Edgelaw reservoir, leaving 5,399,167 gallons per day to be obtained for the Edinburgh supply from the Glencorse catchment area proper. Then we get the whole of the Portmore and Tweeddale area, representing a yield of 2,433,750 gallons, making altogether 7,832,917; but out of that we have agreed to give 490,000 gallons to the owners of land on the stream as compensation water. That will leave us for Edinburgh 7,342,750 gallons. The storeage capacity of the Glencorse reservoir is 182½ days—that is, six months. The calculated supply of the district will be 272 million cubic feet. It is proposed to raise the Portmore reservoir about 10 feet, and the capacity of that reservoir will then be 40 million cubic feet, or 250 million gallons. The estimate for the whole of the works is £294,600. Unless this was a pure water I would not propose to bring it into Edinburgh. It is not a fact that a large proportion of the Glencorse area is agricultural and peaty land.

The CHAIRMAN: You are now going into the quality of the well, and as I see pretty well all the learned counsel in this case present, I will take the opportunity of making an observation to them on behalf of the committee. The fact is, that the committee are very strongly of opinion that there is a very large amount of personal feeling and of bitterness underlying the whole of this case, and they cannot but think that a committee of the House of Commons is not perhaps the best place for allaying those differences, and for coming to a satisfactory conclusion on the matter in hand. They fancy that if the learned counsel in the case were to bring to bear upon it that practical knowledge which they possess, removed as they are from the heated atmosphere of local differences, they might arrive at a much more satisfactory conclusion than they can hope to do by fighting out this question before us, and calling upon us to come to a decision upon the question. Of course the committee are perfectly ready to sit here as long as the session lasts in hearing out this question, if in the opinion of the parties such a course should be considered necessary; but we venture to throw out this suggestion that we think the matter might be very well settled on the other side of the counsel's table, if the parties would only come to the consideration of the subject with an earnest inclination and desire to settle their differences quietly, and on the give-and-take principle. I am bound to say that, as far as the evidence has gone, the committee entertain a strong opinion that if any arrangement could be come to, the payment of the costs of the previous Acts ought to be included in the payment of costs of the present Act. I would add that if, at the termination of this day's proceedings, there seems in the minds of the learned counsel any prospect of arriving at a satisfactory conclusion, the committee would be very willing to adjourn over to-morrow, in order to give time to the parties to consult together.

Examination continued: There is some peat on the top of the hills in the area of the Gladhouse reservoir; but I believe it is the same geologically as the St. Mary's Loch and Manor districts. As to the works in the Glencorse Valley, there is an overflow here at present, owing to there not being sufficient storeage for the maximum flow of the stream, and, in order to preserve the water, a great deal of which is now lost, we propose to have what we call the Denscleuch reservoir in the Glencorse Valley. The natural catchment of this reservoir is not great, but we bring water from an upper reservoir for the purpose of being stored in the Denscleuch reservoir. Mr. Ramsay, equally with the rest of the landowners in this district, would be benefited by the proposed works in the Glencorse Valley. The only injury we do to Mr. Ramsay, as far as I can see, is that we shall obtain an easement on his land for the purpose of putting down a pipe. When the pipe has been put down, the land will be restored to as good condition as it was in before. I believe he has no property on the South Esk.

Mr. SOMERSET (in cross-examination): I ask you whether this bill will not pretty well ruin the Mid-Lothian Company?

*Witness:* They are pretty well ruined already. We do not in this bill meddle with their district. I do not see that going through Mr. Ramsay's property for the extent of half a mile will be any great injury if he is well paid for it. We propose to store in the Denscleuch reservoir for a dry season 220 million gallons of water, which now runs down the stream. I agree with Mr. Hawksley that there is a great deal of suppressible waste in Edinburgh, but it has been reduced a good deal, and I admit that a great deal more may be done in that direction.

Cross-examination continued: About 12 per cent. of the catchment area of the Glencorse reservoir is peaty. There is peat in the middle of the reservoir, I know, but that will not affect the water; for should it be found necessary to cover the peat over, we propose to take power to do so. I do not say now that it will be necessary to do this.

At the close of the sitting the CHAIRMAN asked whether there was any probability of an arrangement being come to.

Mr. DENISON said the matter must be left to the parties themselves. If they could come to an arrangement, well and good; but counsel could not interfere.

The CHAIRMAN expressed his regret that such should be the case, and that there was not a prospect of the matter being left to the cooler heads of counsel to bring it to a satisfactory issue.

Mr. DENISON expressed his belief that Edinburgh had no feeling in this matter except one, and that was that the Mid-Lothian Company had not sufficient water to give them. That was the whole secret of the matter, and Edinburgh was determined to go on and have a thoroughly good supply of water.

Mr. SOMERSET said he hoped the chairman would not take for granted the statement of his learned friend that they had not enough water to give to Edinburgh.

THURSDAY, MAY 21.

Mr. VENABLES said that since the adjournment on the previous day there had been a meeting between the parties, in the hope of coming to some agreement which would stop the necessity of any further contest over the bill. Both parties had interchanged their views thoroughly, but he regretted to say that the result had not been satisfactory. Having thus failed among themselves, the Mid-Lothian Water Company, which he represented, was anxious, if possible, to get the committee to mediate with the view of arriving at a better conclusion. On behalf of his company, he begged to submit two alternative propositions for the acceptance of the promoters of the bill. The first was that the Mid-Lothian Company, being possessed of an existing Act enabling them to supply Edinburgh with water, were willing to transfer their undertaking, with its rights, privileges, and obligations, to the Edinburgh and District Water Trust on equitable terms to be determined by the committee or by some arbitrator to be appointed by them. The second, or alternative proposal, was that all interference with the limits of the water supply of the Mid-Lothian Company, granted by Parliament last year, be expressly excluded, and that clauses 24, 29, and 36 be struck out. With respect to the supply of water provided for the landowers under the weir clauses of the bill, the promoters to be put under an obligation to take from the Mid-Lothian Company an equivalent of one million gallons per day. These proposals were made by the Mid-Lothian Company for the purpose of showing that they were willing to come to an equitable arrangement. If these terms were not accepted by the promoters, he hoped that the committee would bring some pressure to bear upon them, in order to induce them to come to terms. The Mid-Lothian Company were by no means anxious to continue the contest.

Mr. CLERK, on the part of the promoters, expressed astonishment and regret on hearing the remarks of Mr. Venables. The parties had met in private, had discussed certain proposals in confidence, and here was Mr. Venables actually asking the committee to force the promoters to accept in the committee-room what they had refused at the private conference. He protested against such a procedure, and contended that the bill should be allowed to proceed just the same as if no compromise had been attempted.

A long conversation, sustained with some warmth, ensued. No arrangement, however, seemed likely to be made, and the case therefore proceeded.

Mr. *Leslie* recalled, and cross-examined by Mr. SOMERSET.

I am aware that the Mid-Lothian Water Company have power to take 5 million gallons, but I do not believe they can get it. We do not expect to get any regular supply from Denscleuch. It will only make up the deficiency in dry seasons. We will always be able to get 2,500,000 gallons without the Denscleuch reservoir. We take power to supply the five parishes mentioned in the 24th section of the bill, which are within the Mid-Lothian Company's district, but not till that company cease to exist.

Re-examined by Mr. CLERK: We shall not take any revenue from that company. The gauges have shown that I was right in saying they could not supply the water from the manor. An acreage of 8288 is the whole area from which the Manor Company could get water both for town supply and compensation. In my report of 1870 it was stated at 10,500 acres. The water in that case was to be carried through the ridge by a tunnel, but a great part of the water from the area referred to could not go over the ridge. Mr. Stewart excluded part of the 10,500 acres from his lower reservoir, and therefore his catchment was much smaller than mine. Instead of being 10,000 acres, it was 8000 odd. When, in the *plébiscite* paper, I gave him credit for 8280 acres, I was giving him the gathering-ground for compensation as well as for town supply. As much as 3000 acres of that was below the level of the intakes for town supply; but this did not signify, because part of the water was required for compensation, whether high or low.

Mr. CLERK: The springs in the manor are not perennial, because of the heavy rain. They increase rapidly, and in two or three days fall from 7 million to 3 million gallons.

*Witness:* We had them falling from 12 million to 3 million gallons, and we could not go beyond the 12 millions, because our gauges would not take the water. When running 12 million gallons, the water would be discoloured with mud and sand, and it runs directly into the pipe without settling in a reser-

voir. In the way of storeage for town supply, they only provide for 75 million gallons, or 15 days supply.

Mr. *T. Hawksley*, examined by Mr. DENISON.

I have been very intimately acquainted with the Edinburgh water supply from 1830. I have been at various times consulted by the water company, the ratepayers, and the Water Trustees, and have had opportunities of looking at the question from every point of view. I reported to the water company in 1865 in favour of the Moorfoot scheme. I arrived at the conclusions of that report after very careful examination of the district, and consultation with Mr. Leslie and Mr. Ramsay and with the board of directors. The report does not differ from the present, except that certain Acts of Parliament since passed have, to a certain extent, interfered with the district. The Musselburgh and Dalkeith Act took the site of one of our intended reservoirs, so that to a certain extent the area of the district has been diminished since I made the first report. If it had not been for the passing of those Acts, my report might still be taken in its integrity. In the report I commented on the Pentlands. I reported favourably of the Pentlands, but I added that water could be got more economically and of equal quality from the Moorfoot. On my advice the ratepayers opposed the St. Mary's Loch scheme, and I was examined many times against it. I have read all the evidence I gave very carefully, and there is not an answer which I wish to modify, excepting a few mistakes chiefly in figures, made either by the shorthand writer or the printer. There is nothing in the substance of the evidence that I wish to alter or amend. The facts of the scheme before the committee may be put in very short form. We take two-thirds of the Gladhouse area of 6031 acres, giving the other third in compensation down the stream, with the exception of 290,000 gallons which are transferred from the South Esk to the Elgelaw reservoir. Then the case stands thus—that we obtain from Gladhouse for the use of Edinburgh 5,399,167 gallons, reckoned at 1¼ million gallons per 1000 acres, the produce of 20 inches of rainfall. We get the whole water of Portmore Loch and of Tweeddale Burn. These two represent 1947 acres, and they produce 2,433,750 gallons. Adding these we find there will enter the Edinburgh pipe 7,832,972 gallons. But then we have out of the Edinburgh pipe to give the large landowners quantities of water which in the aggregate amount to 490,000 gallons, and therefore there is left for Edinburgh from this district 7,342,970 gallons. In addition to that, we obtain from Denscleuch in the Pentlands 1,160,000 gallons, so that the total quantity to come to Edinburgh is just over 8,500,000 gallons per day. The minimum of the existing works in the driest year is 6,500,000 gallons generally, and it is a great deal more, even as much as 8,000,000, but in the driest years it is 6,500,000. Therefore the entire scheme, as now presented to the committee, is for a supply of 15,000,000 gallons per day. For a population of 600,000, that is equal to 25 gallons per head, and for the present population of 265,000 it is 60 gallons per head. The increase in the population of Edinburgh is about 5000 a year, but you cannot expect that large towns will always go on increasing at the maximum ratio. The scheme the committee are now dealing with has been approved of and laid down by me concurrently with Mr. Leslie, who has had more to do with the matter than I have. The scheme includes filter-beds and covered service reservoirs, so that we shall give the supply of water in its purest form. The whole of the present water is not filtered, therefore we should give better water than is now supplied to the city. The gathering-ground is very excellent. The greater part of it is Silurian minerals, which yield very pure water, and the lower portion is what is commonly called the lower coal measures, but which do not contain the coal. They give water which is chemically all but as pure as the other. I have considered the question of compensation. My figures correspond with Mr. Leslie's on that question, the results of those figures being the quantities inserted in the bill. It is precisely the usual amount of compensation, *plus* the small quantity which is given in excess to the great landed proprietors whose properties are affected. I agree with Mr. Leslie in the estimates. I do not believe that Edinburgh can get a better, cheaper, or more advantageous supply of water than is proposed in this scheme. I have consistently throughout advocated a supply from this district. As to the Mid-Lothian scheme, I think it is out of the question as to supplying a large quantity of water. In ordinary dry seasons they will possibly be able to get 2,500,000 gallons by the aid of their small reservoir, which is at a place called Manonhead. That is the utmost they could get. But in the very dry seasons the scheme will not produce so much as 1,500,000 gallons of spring water at the spring heads. I say that on very great experience with reference to this subject in all mountain districts in England and Scotland. I may tell you what is taking place at this moment. We have had dry weather for a very considerable time, but not such dry weather as we sometimes have in August, September, and October. Last week I was under the necessity of measuring the water coming down, and it is quite an analogous case. From certain hills in Yorkshire there is not half a cubic foot per second coming from 1000 acres, and these hills are rather more productive of water than the Lauder Hills of the Silurian measures. If a drought comes, there will be less than 2 million gallons a day from the whole 5280 acres of the Manor. They give sometimes 10 million, 20 million, or even 50 million gallons, but of course they cannot get it to the pipes, it simply goes down to the brooks; but when the dry season comes the supply is reduced to the volume I have spoken of. I have seen all their plans, and am thoroughly acquainted with their scheme.

Cross-examined by Mr. VENABLES: I was present a good deal in the committee of last year, and was examined. I know that an important part of the contest was as to the power of the Mid-Lothian Company to supply 5 million gallons. They alleged that they could supply at least 5 millions, and I and others gave evidence to the contrary effect.

Mr. VENABLES: And both Houses of Parliament sanctioned the scheme on evidence which satisfied them that the company could give the supply?

*Witness:* Quite the contrary. I happen to know that the committee thought they could supply the villages in the country, and that there might be something left for Edinburgh.

Mr. VENABLES: But that was the decision of Parliament on the issue raised before the committees?

*Witness:* No; it was a decision of Parliament as to whether the bill was to pass, but it was not a decision which announced any quantity whatever.

Mr. VENABLES: I do not suppose a decision ever announced any quantity whatever. The Mid-Lothian applied to Parliament to sanction their scheme, alleging and establishing as far as they could by evidence that it would supply 5 million gallons?

*Witness:* They established a great many things, but what they established to the satisfaction of the committee, which induced them to pass the bill, may never be known.

Dr. *Letheby*, examined by Mr. DENISON.

I have had a great deal to do with the analysis of water for domestic use, and for the supply of various towns and cities. I have made myself acquainted with the quality of the South Esk water at Gladhouse Mill. I have had a great many samples. I analyzed the water in 1870, and again in 1872. In 1873 I made three analyses, and during the present year 40 or 50 analyses. Professor Voelcker assisted me in these examinations. The more recent samples appear to have been collected daily from the 8th to the 31st of December. Then they were continued from the 1st to the 31st of January. The analyses of the water taken in December showed that the water contained 5·71 grains of solid matter to the gallon. This chiefly consisted of carbonate of lime and sulphate of lime, with a little chlorate of sodium. The hardness stood at 3·6. In the 1st of January water there was 5·3 of solid matter, and the hardness was 3·4 From these examinations I say that the water is good and wholesome. It is a soft water, but it is a wholesome water, fit for the citizens of Edinburgh to use. I made an examination of the St. Mary's Loch water, as also the water from Tweeddale Burn and Portmore Loch. The latter waters are much better than that of St. Mary's Loch. The loch water was very soft, containing three to four grains only of solid matter, and about half of that peat.

Dr. *Voelcker*, examined by Mr. POPE, spoke to having analyzed the samples of the water, and said his results agreed very closely with those of Dr. Letheby.

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FRIDAY, MAY 22.

Mr. *D. Stevenson*, examined by Mr. CLERK.

I am a civil engineer, and am familiar with the Moorfoot Valley. Gladhouse is a suitable place for a large reservoir. I got samples taken of the water, and they were sent for analysis. I have also examined the Fullarton Burn. Ordinarily it is as clear as the South Esk, but after rain it becomes mossy.

Mr. SOMERSET asked permission to postpone the cross-examination of the witnesses, as he was informed that negotiations were proceeding between the parties which might render it unnecessary.

Mr. *J. F. King*, examined by Mr. CLERK.

I am public analyst for Edinburgh. On March 14 I received nine samples of water in sealed and labelled bottles. They were all marked with the initials of Mr. Frew. There were 18 samples in all. Mr. Dewar took nine and I took nine. I carefully analyzed these samples, and prepared a report in a tabular form. It shows the South Esk water to be of good quality, and well fitted for the supply of Edinburgh.

Mr. *James Dewar*, examined by Mr. CLERK.

I am a member and Fellow of the Royal Society of Edinburgh, and a lecturer on chemistry at Edinburgh. I examined nine samples of water which were given me at the office of the Water Trust. The analytical results are embodied in a report. The analysis showed that the water is very fit for domestic use. It showed there was no presence of sewage in the water. The hardness is not quite so good as the present Edinburgh water. From what I know and have seen of the locality, it is well fitted to be the source of the water supply of Edinburgh.

By the CHAIRMAN: There is a very small quantity of ammonia in the water. The water is very free from sewage matter. There is sufficient carbonate to make it wholesome. I paid a visit to the district of the South Esk, and, from personal observation, I satisfied myself of the purity of the water of the Gladhouse Burn.

Mr. SOMERSET: I am happy to say that I am instructed to inform the committee that an arrangement has been come to between the promoters and ourselves, and therefore we propose to withdraw from the case. The promoters will bring up a clause carrying out that arrangement.

The CHAIRMAN: I presume Mr. Ramsay also retires?

Mr. SOMERSET: Yes; I should have stated that.

Mr. CLERK: The only question that remains is with regard to the payment of the costs.

Mr. *Thomas Wood*, Provost of Portobello; Mr. *Josiah Livingstone*, and Mr. *C. Mackenzie* were examined with respect to the clause which provides for the raising of a rate to pay for the expenses of the bill of 1871.

Serjeant SARGOOD then addressed the committee, and asked them, on behalf of the ratepayers, to take one of two decided courses—either to insert words in the preamble which should distinctly and authoritatively express their opinion that if any costs at all were paid out of the common purse of the ratepayers, all the costs were to be paid, or that they would pay no costs to anybody at all. If the committee thought that equity involved due consideration of the interests of both parties, he was willing that that equity should be administered, and that, he was sure, would be the best means of promoting what the committee desired to see—an end to the personal feeling and local excitement which necessarily had been thrown into this case. If that could not be done, he asked the committee to abstain from doing that which would make present confusion ten times worse confounded—namely, to pay out of the public funds the expenses of the promoters who had failed.

Mr. CLERK said the promoters had proposed that not only the costs incurred in promoting the Loch Bill, but such portion of the opponents costs as remained unpaid should be authorized to be paid, but the clause for affecting this had been struck out of the bill. The present trustees, who were almost entirely a different body from the trustees of 1871, considered it to be the duty of the ratepayers to pay the costs of their predecessors. There could be no doubt that the latter committed an error of judgment. Possibly they could have selected a better source of supply than St. Mary's Loch, but there was no objection raised in Edinburgh till they had taken considerable steps in promotion of the scheme. The trustees had a public duty thrown upon them. To the best of their judgment they selected a proper source, and therefore he thought everybody must see that it was perfectly fair and equitable that their costs in promoting the scheme should be paid. The cases of the Glasgow Water-Works Act and Glasgow Bridges Acts showed that Parliament would sanction the payment of unsuccessful schemes in subsequent legislation. It was argued, however, that they should also pay the costs of the opposition. He asked the committee to recollect how those costs were incurred, and by whom they had been paid. He had no doubt that a large sum had been collected, and the whole sum had been paid except £2000, which might possibly fall on some of those who took a leading part in the opposition. Unfortunately, the chairman spoke the other day of all the costs being paid. He thought the committee would see there was nothing really equitable in that. The liability for the £19,000 must fall on three or four prominent individuals who gave instructions and took an active part in the promotion of the loch scheme. The large body of opposing ratepayers had by their contributions discharged a portion of the £10,000, and their petition contained no request for repayment. In regard to the £2000, it might be that Mr. Mackenzie and other gentlemen who took a prominent part might be placed in the same position as the promoters of the abortive bill, and it had been considered fair that they should be paid that small sum. The present promoters would be perfectly willing to come to an arrangement in order that those gentlemen might be paid some such sum as that. They would be glad to have the clause to that effect inserted, but Lord Redesdale said there was no equity in the matter. The promoters of the loch bill might have an equity in asking to be paid, because there was a public obligation to proceed with the bill, but the opponents voluntarily took upon themselves the expense of opposing. There was no principle known to Parliament under which a body of ratepayers opposing a scheme prejudicial to their interests were entitled to have their costs paid. If there was such a principle, there would be no difficulty in Lord Redesdale agreeing to such a clause; but in the face of the obstacle referred to, the promoters could not propose to the committee to insert such a provision. If, however, Mr. Mackenzie and the petitioners, who presented this petition in a very different tone and sense from that in which they now spoke, were prepared to come to some reasonable arrangement by which any unfair liability for costs might be removed from them, they would find every disposition on the part of the promoters to come to an arrangement in which, without infringing on the rules of Parliament, the object might be effected. He thought, if the ratepayers were in earnest, some reasonable arrangement might be made before the reassembling of Parliament. Meantime, he asked the committee to sanction that which they could really carry through Parliament—the payment of the costs of the old trustees—and not to insert a clause which would have the effect of either defeating the bill or rendering nugatory that which they considered just.

Mr. WILL said the ratepayers were perfectly disposed to come to an arrangement.

After some further conversation, the room was cleared, and the committee deliberated for a short time. On the parties being readmitted,

The CHAIRMAN said: The opinion of the committee is that the preamble of the bill has been proved to our satisfaction. At the same time, the committee cannot forbear making the observation that the opposition which was offered to the bill in 1871 has, in fact, resulted in a saving to the ratepayers of a very large sum of money by substituting the Moorfoot scheme for the St. Mary's Loch scheme, and they earnestly hope that the question may be liberally dealt with by both parties in coming to any future agreement.

Serjeant SARGOOD: As the preamble has been passed, we must withdraw.

Mr. CLERK: I hope calmer counsels will prevail, and that we shall agree to fair and equitable terms before we go elsewhere.

The CHAIRMAN: That is precisely the view which the committee take of the matter. We hope that during the recess some arrangement satisfactory to all parties will be arrived at.

The settlement of the clauses was then proceeded with. During this part of the proceedings,

Mr. CLERK announced that all differences between the parties had been settled, and he believed peace would prevail for a great many years in Edinburgh on the water question. He could assure the committee, on the part of the Water Trust, that they were very thankful to them for the suggestions made, which had been the means of leading the parties to concord.

Mr. SARGOOD, on behalf of the ratepayers, felt bound to say they were indebted very deeply to the committee and to the chairman personally for the suggestions made on the previous day, because they had paved the way to the present settlement of all differences.

# Miscellaneous News.

## METROPOLIS GAS SUPPLY.

Report on the gas supplied by the Imperial Company to the vestry of St. Pancras, during the month of May, 1874. Maximum light estimated by sperm candles, according to the Act—15·7. Minimum light, sperm candles—13·2. Average light, sperm candles—14·4. Traces of ammonia, indicated by turmeric test-paper—at all times traces. Traces of sulphuretted hydrogen, indicated by lead test paper—none at any time. Sulphur—22·17 grains per 100 cubic feet of gas. The illuminating power was nearly the same as during the preceding month.—THOS. STEVENSON, Gas Examiner.

## METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following returns of the average daily quantity of water supplied by the London water companies, during the month of April, 1874. According to these 112,124,179 gallons, or 509,431 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight) were supplied daily; or 220·3 gallons (100·1 decalitres), rather more than a *ton* by weight, to each house, and 31·0 gallons (14·1 decalitres) to each person. According to returns of the London water companies made to the select committee on East London Water Bills (session 1867), it is estimated that, during the year 1866, about 82 per cent. of the total supply of water for all purposes was for domestic use. Applying this proportion to the total quantity supplied daily in the month of April, 1874, it may be estimated that about 91,941,827 gallons were used for domestic purposes, or about 25·4 gallons per day for each inhabitant, against 25·2 in the corresponding month of last year. This proportion varies from month to month, but the Registrar-General has no means of giving a more exact estimate.

| COMPANIES. | Number of Houses, &c., supplied in Apl., 1873. | Apl., 1874. | Aver. Daily Supply of Water in Gallons* during Apl., 1873. | Apl., 1874. |
|---|---|---|---|---|
| Total supply | 503,127 | 509,017 | 109,807,217 | 112,124,179 |
| From Thames | 235,539 | 239,456 | 57,857,844 | 59,442,915 |
| „ Lea and other Sources | 267,588 | 269,561 | 51,949,373 | 52,681,264 |
| THAMES. | | | | |
| Chelsea | 28,270 | 28,467 | 8,201,700 | 8,282,400 |
| West Middlesex | 44,565 | 45,604 | 9,019,458 | 9,116,264 |
| Southwark and Vauxhall | 79,194 | 79,596 | 17,784,636 | 18,100,000 |
| Grand Junction | 34,243 | 35,144 | 11,319,550 | 11,623,051 |
| Lambeth | 49,267 | 50,645 | 11,532,500 | 12,321,200 |
| LEA AND OTHER SOURCES. | | | | |
| New River | 121,015 | 122,063 | 22,147,000 | 23,016,000 |
| East London | 104,637 | 105,562 | 25,707,900 | 20,685,000 |
| Kent | 41,936 | 41,936 | 6,094,473 | 6,980,264 |

* Including that for manufactures and for various purposes other than for domestic consumption.

*Note.*—The return for April, 1874, as compared with that for the corresponding month of 1873, shows an increase of 5890 houses, and of 2,316,962 gallons of water supplied daily.

Dr. Frankland's, F.R.S., report on the quality of the water supplied to the metropolis during the month of May shows that the water of the companies drawing from the Thames had greatly improved in quality by comparison with the condition of that supplied in the previous month; the water of the New River and East London Companies taken from the Lea had also undergone improvement, and continued to be of a quality superior to that of the Thames Companies waters. The sample of the East London Company's water taken for analysis contained no evidence of previous sewage or animal contamination. The deep wells of the Kent Company yield, from the chalk, water again reported to be "superior to that of any other company supplying the metropolis." The turbidity of the river waters, noticed in April, had ceased on the 1st of May, when all the waters examined were found to be "efficiently filtered and, consequently, clear and transparent." Taking the amount of organic impurity contained in a given volume of the Kent Company's water as unity, the proportional amount in an equal volume of water supplied by each of the other metropolitan companies was—New River, 1·1; West Middlesex and East London, 2·4; Southwark and Grand Junction, 2·6; Lambeth, 2·9; and Chelsea, 3·1.

## DUNDEE GAS COMMISSION.

### REDUCTION IN THE PRICE OF GAS.

The Finance Committee of the Dundee Gas Commission held a meeting on the 29th ult., when the accounts for the past year were submitted and approved, and the estimate of revenue and expenditure for the current year was taken into consideration. The former are made up to the 30th of April, 1874, and the capital account shows that during the 12 months there have been expended £24,353 13s. 1d., and carried to general balance-sheet, £11,481 8s. 7d., which, together with £54,019 18s. 4d., expended at last balance, make a total of £89,855. This has been met by £69,770, borrowed at last balance, and £20,085 this year. The revenue account is as follows:—

*Expenditure and Receipts.*

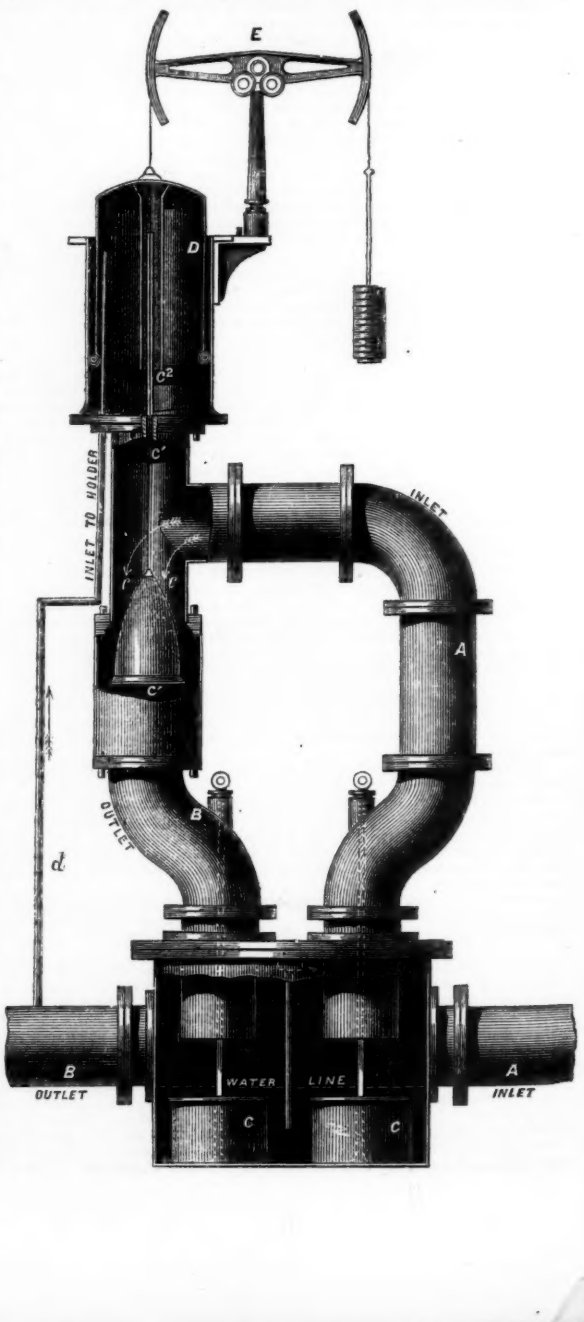
| | £ | s. | d. | | £ | s. | d. |
|---|---|---|---|---|---|---|---|
| Balance from April 30, 1873 | 638 | 3 | 5 | Gaslight account | 61,423 | 7 | 7 |
| Coal account, including firemen's wages | 44,902 | 11 | 4 | Meter-rents | 2,147 | 16 | 7 |
| Purifying account | 1,461 | 6 | 6 | Coke | 1,862 | 0 | 7 |
| Main-pipe repairs | 146 | 19 | 4 | Chemical products | 2,430 | 17 | 3 |
| Service-pipe repairs | 225 | 16 | 0 | | | | |
| Meter repairs, including inspectors and fitters wages | 398 | 12 | 10 | | | | |
| Retorts and setting | 1,023 | 7 | 11 | | | | |
| Gas apparatus, tools, &c. | 541 | 13 | 11 | | | | |
| Repairs of buildings | 286 | 8 | 2 | | | | |
| Refuse account | 221 | 6 | 5 | | | | |
| Rents, feu duties, &c.—less rents received | 244 | 3 | 9 | | | | |
| Interest on mortgages | 3,098 | 12 | 8 | | | | |
| Expense of loans | 172 | 11 | 5 | | | | |
| Interest on bank account | 186 | 19 | 10 | | | | |
| Assessments, taxes, &c. | 1,664 | 17 | 1 | | | | |
| Salaries, including collection of revenue | 2,056 | 16 | 2 | | | | |
| Stationery, printing, &c. | 183 | 14 | 6 | | | | |
| General expenses | 234 | 2 | 10 | | | | |
| Annuities | 8,662 | 10 | 0 | | | | |
| Redemption of annuities and mortgages (sinking-fund) | 1,600 | 0 | 0 | | | | |
| Contingent-fund | 500 | 0 | 0 | | | | |
| Surplus—carried to general balance-sheet | 13 | 7 | 11 | | | | |
| | £67,864 | 2 | 0 | | £67,864 | 2 | 0 |

From the very satisfactory state of the accounts, it was agreed to recommend the commissioners to make a reduction in the price of gas from 6s. to 5s. 8d. per 1000 feet, with discount at the rate of 5 per cent., payable within 28 days.

## ELLIOTT'S IMPROVED STATION GOVERNOR.

This governor has been devised for the purpose of obviating some of the difficulties experienced in the application and working of ordinary governors at gas-works, and has now been for 12 months in successful operation at the Stourbridge works, producing a much greater uniformity of pressure in the outlet mains than the ordinary governor.

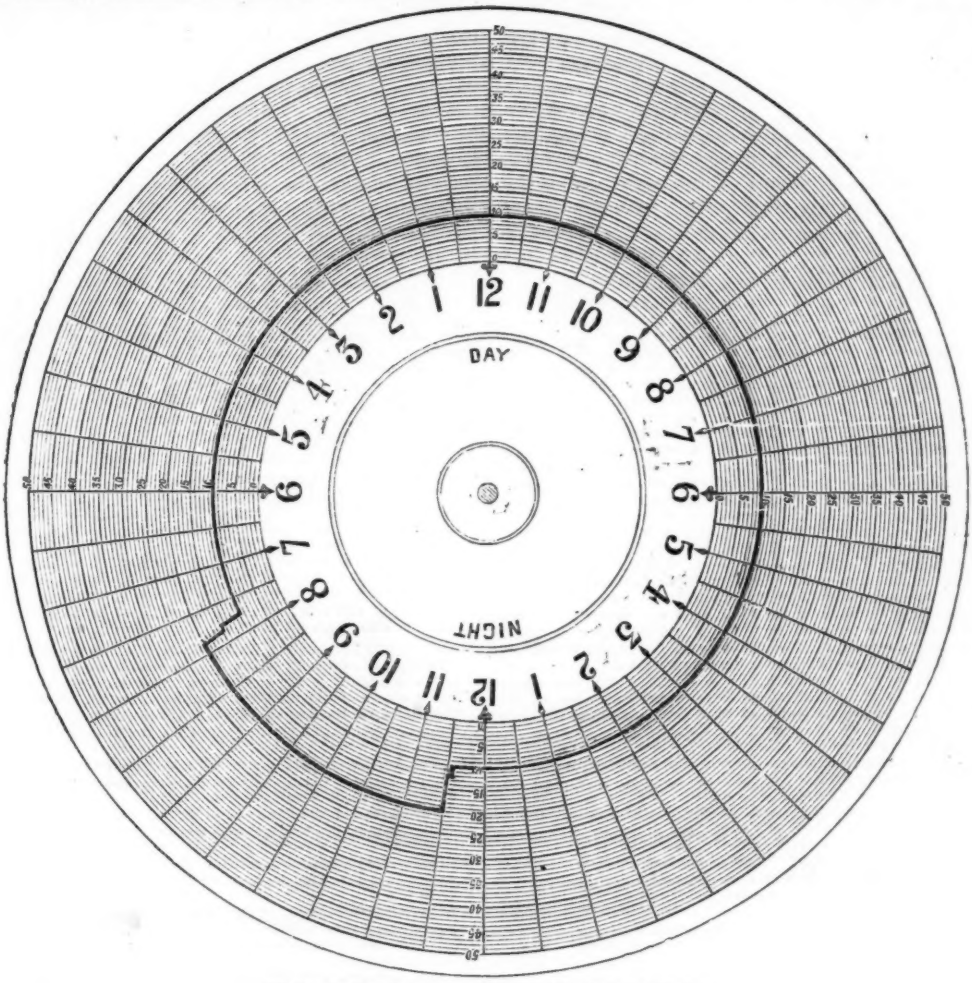
The improved governor has a conical or bell-shaped valve regulating the outlet of the gas in the same way as in an ordinary governor; but, instead of this valve being operated by a lifting cylinder or gasholder, through which the whole body of gas passes, as in the ordinary arrangement, it is in connexion with and operated by a lifting cylinder or holder of sufficient size only for the operation of the valve, which cylinder is in communication with the outlet main



by means of a small connecting tube. This arrangement does away with the oscillation caused in the ordinary governor by the sudden variation of inlet or outlet pressure, and also prevents the possibility of explosion from the same cause. Further, this arrangement not only reduces the size of the whole apparatus, thus economizing space, which is of importance in some gas-works; but enables the gasholder or operating cylinder to be placed at any height in relation to the regulating-valve by simply making the necessary small tubular and suspending connexions between the operating cylinder or holder and the valve.

This governor also admits of an arrangement of mains by which a bye-pass can be constructed in a much simpler and less expensive manner than usual, and the bye-pass may be controlled by hydraulic valves or slide valves, as preferred.

The construction and operation of this governor is shown by the accompanying figure, in which A A are the inlet mains, B B are the outlet mains, C C are hydraulic valves for shutting off the governor. The tank in which they are placed also acts as an ordinary syphon for the collection and removal of the products of condensation. C is the conical or bell-shaped valve regulating the outlet opening through which the gas passes in the direction of the arrows, *c c*, and is of the ordinary construction, and connected by the rod $c_1$ to the gasholder or operating cylinder, D. This rod passes freely through a tube, $c_2$, which is covered by an outer tube attached to the centre of the interior of the gasholder, so that the inlet pressure acts but upon a very small portion of the area of same, but sufficiently so to counteract the variation of inlet pressure on the conical valve. The gasholder, D, is of the ordinary construction, with its exterior water-tank, and is suspended by a small steel band to the balance-lever, E, through which the actual pressure for night and day is adjusted or varied by the balance-weights shown. The communication of the gasholder with the outlet-pipe is made by means of the inlet or equilibrium tube, *d*, as shown. The gasholder required in this arrangement is quite small as compared with the ordinary arrangement, a 15-inch holder being sufficient as a minimum size for a 10-inch governor. In case of an accidental displacement of the holder or failure of the water-joint, there can be no dangerous escape of gas from the small tubular connexions with the mains adopted in this governor. The foregoing description will render the operation of this governor quite clear to our readers. It has been found to be very successful in action. The diagram appended is one taken at random from those filed day by day from the pressure registers of the Stourbridge Gas-Works, and from this the action of the governor may be judged.




*Elliott's Station Governor.—Diagram from Pressure Register.*

## ASSOCIATION OF MUNICIPAL AND SANITARY ENGINEERS AND SURVEYORS.

The Annual Meeting of the Members of this Association was held in the Council Chamber, Moor Street, Birmingham, on Thursday, May 28th—Mr. Lewis Angell, C.E., President of the Association, occupied the chair.

The annual report showed that the progress of the society during the past year had been most encouraging. The firm and steady hold it was taking, through the district secretaries, upon the members of the profession, would ensure a success, and create a power which would be felt and acknowledged in connexion with sanitary science and sanitary legislation. At the present time there were 137 members of the association. Three district centres were in active work, and they hoped to have in a few days a fourth—viz., the Home Counties—in operation. Two district meetings had taken place during the past year, one at Birmingham and one at Leamington. The sewage farm of Warwick and Leamington was visited, and a paper upon an interesting and important subject in connexion with the objects of the association was read. The second district formed comprised Lincolnshire and Cheshire. A district had also been formed for the important county of Yorkshire, and they expected soon to have a large number of members. A fourth district—namely, the Home Counties—was in course of formation.

On the motion of Mr. Davidson, seconded by Mr. Escott, the report was adopted.

Mr. Monson moved, and Mr. Davey seconded, the re-election for the ensuing year of the chairman and other officers.

Mr. Thornburn moved an amendment to the effect that a second vice-president should be re-elected. Seeing the extent of the society, he thought the business was too much for one such officer.

A further amendment, that there should be three vice-presidents of the association, was moved, but not seconded.

The original resolution was carried, after which, on the motion of the Vice-President, it was decided to hold the next annual meeting at Manchester.

### The Chairman's Address.

The President (Mr. Lewis Angell) then delivered his inaugural address. After congratulating those present upon the success which had attended their efforts to establish the association, he said they had united the scattered members of a special branch of their profession, and created an *esprit de corps*; already they had a history and an influence. He would briefly review some of the subjects to which the attention of the association might with advantage be directed during the ensuing year. The position of local officers, he regretted to say, was not satisfactory. They still lacked that support and protection which, after 21 years experience, he emphatically declared would alone render them efficient officers, superior to local influence, and interested or ignorant obstruction and attack. There had been a marked improvement during the year in the inducements offered to their profession to accept municipal employment, which he hoped was partly due to a better appreciation of sanitary services and requirements. With regard to the work of members, first and foremost stood that most troublesome and vexatious of all subjects with which they had to deal—the sewage question. Was sewage a mine of wealth or a Slough of Despond? As that subject would be discussed on the following day, he would not enter into the technical part of the question. He must remark that the present legislative aspect of the question was most unsatisfactory, and that municipal authorities and their official advisers had been placed in a most difficult position by the uncertain action of the Government. Upon sanitary matters there had been over legislation, as well as too little legislation—if he might use the expression, there was too much law and not enough of gospel. Sanitary enactments had overreached practical facts. If some of the official energy which had been directed to the detection and prosecution of unfortunate towns were directed to the discovery of the remedy; if there were some declaration or authority of what might be accomplished, and what was satisfactory under certain given conditions, the Government would render a real service to the country; instead of which they were without guidance, and referred to the unmeaning formula, "The best known practical process." Government inquiries were held all over the country at great cost, deputations went from town to town inspecting and reporting, the same evidence and the same facts were repeated over and over again before Government inspectors and parliamentary committees; in all this there was waste of money, energy, and time. A Government commission might establish, as far as could be ascertained, some standard method applicable to varying circumstances of meeting their own standard of

purity. It surely ought to be well known whether the intermittent scheme of filtration at Merthyr Tydvil was or was not a success, and how far it might be applied elsewhere under similar or different conditions; whether or not irrigation farms were successful; wherein they failed, or under what conditions they should be undertaken. If, from local circumstances, any one of such systems were inapplicable, it should be known what other processes, chemical or mechanical, would meet the varying circumstances of the case. Surely there was work for a Royal Commission. On the one hand, they had been told, with all the weight of official authority, that in sewage there was a mine of wealth, and that its waste was a "stupid crime." Whilst, on the other hand, speculative enthusiasts had lost a "mine of wealth" in search of this El Dorado. For 20 years past, parliamentary committees and Royal Commissions had inquired, experimented, and reported; but they had lived to see the reporters repudiate their own recommendations. Such results as Birmingham and West Ham did not encourage engineers to delve for the mine of wealth, or attach much practical value to official inquiries. There had been volume upon volume on irrigation, and town after town had been refused irrigation. A Government inspector had reported unfavourably upon the financial results of sewage farming, and declared that nothing short of "absolute necessity" would justify a town in undertaking a large irrigation scheme. Chemical systems had been tried and had failed, and the Royal Commissioners reported that chemistry held out no hope. Could a greater dilemma for the ratepayers be imagined? Instead of thus remaining floundering in the mire, and having no policy of sewage, it would be better that the Imperial Exchequer should expend a few thousands in crucial experiments for the guidance of the nation, than that town after town should be harassed by injunctions and penalties, in addition to the waste of thousands in partial, imperfect, and altogether unsatisfactory attempts to solve the vexed question. At present engineers could not advise, and towns would not act. They were at the mercy of Government inspectors, who changed their opinions and differed among themselves. It was full time that some definitive legislative action should be taken. The subject of sewage pollution and purification suggested that of water supply. The insufficiency of water, the waste of water, and the purity of water were important questions for the engineer and the sanitarian. The insufficiency of the water supply in many towns was a fact which was forced upon the attention of every traveller. Concurrently with insufficiency they found absolute waste, due to carelessness and defective pipes and fittings. There was great waste in the purification of water not required for domestic purposes. Out of the 30 or 40 gallons per head of water supplied to the population less than one-fourth was used for domestic or drinking purposes, the remainder being used for street watering, fire extinguishing, sewer flushing, and other processes which did not demand any degree of purity. The necessity for purification of water was confined to the 5 and 6 gallons per head required absolutely for domestic purposes. Such a distinction of supply would, of course, involve a dual system in every house. Town wells would then be safely available for ordinary purposes. The reduction of the purified domestic supply within reasonable limits would, he thought, greatly assist in the settlement of the sewage question by reducing the demands upon water companies, and bringing the standard of sewage purification within easily obtainable limits. Rivers were the natural channels of drainage. The stream which flowed through a cultivated country or populous towns must necessarily be highly charged with organic matters apart from sewage, and largely polluted with street washings, trade refuse, and matter from various sources. Such being the case, was it right that people should derive their water from a polluted source instead of from the pure water-bearing strata, or from the fountain-head, as Sir Hugh Myddelton supplied London two and a half centuries ago, and as recently it had been proposed to supply London and other large towns from the great lakes and watershed districts. If people must needs drink town washing, should not the water companies, who made large profits, intercept and purify town drainage at their own cost, or bear a share thereof? Or should such burdens be thrown on the public, and standards of purity recommended by Royal Commissioners and adopted by river conservancies be maintained by exorbitant rates? This was a subject worthy of discussion. The subject of road watering was open to very much improvement in practice. The present method was slow, cumbersome, and costly. A system had recently been exhibited in London, Brighton, and elsewhere which might be described as an elongated water-cart distributor, connected with the water-mains, and laid longitudinally along the kerb, from which the water was projected laterally over the roadway. By these means a whole town might be watered simultaneously with very little labour by the ordinary road men, and the entire heavy cost of horses, carts, and hydrants would be saved. Allowing for the repayment of capital, the watering of a town would not cost annually more than one-third that of the present cumbrous and inefficient system. Some such system must ultimately displace the water-cart. On the subject of building regulations, he thought nothing short of general building regulations applicable to the whole country would obviate the difficulty. Since their last meeting the practice of cremation had been advocated by so eminent a surgeon as Sir H. Thompson. Societies had been formed in London and New York to promote its practice. No proposition was considered too alarming for the present day; the age of prejudice was passing away, and many proposals which at first shocked our senses ultimately obtained approval. The practice of cremation might shock English feelings and Christian traditions, but he was not prepared to say that it might not ultimately commend itself to the sanitarian. The subject of sewer ventilation was one which would occupy their attention. He would only observe that, in his opinion and experience the best means of preventing foul sewers was the freest admission of fresh air at all points, and the prevention of stagnation by a continuous water-flow. All houses should have free communication with the air. Attention to these points would be more effective than all the cunningly-devised patents. Ventilation, with disinfectants, the dispersion of vapours into the air, the factories refuse into the sewers, was, in his experience, a matter calling for the active interference of both the medical officer and the engineer. The members of the association had ample field for labour, and he thought that their influence upon sanitary progress and town improvement might be great. With qualified officers, intelligent and disinterested boards, and a public educated in sanitary principles, their efforts would be appreciated. He trusted that such expectations were not Utopian, but until such a time arrived they would have "to labour and to wait."

In moving a vote of thanks to the chairman, the VICE-PRESIDENT said he saw no reason why they should not have water-meters for domestic purposes as they did for trade purposes. Each house might be charged for a certain quantity, and if they used more pay for it accordingly. Such a course would prevent the enormous quantity of waste, and the sewage would not be so diluted.

The motion was seconded and carried.

*Building and Sanitary Bye-Laws.*

The VICE-PRESIDENT (Mr. Lemon) read a paper on this subject. The writer said the difficulty of passing the above laws through the Town Council against vested interests was one of the reasons of their incompleteness and their inefficiency. The question he had to put was this—Should the power given to local boards by the Local Government Act of 1858 remain as it is, permissive, or should it be made compulsory? Or should the present regulations by bye-laws be included in a general Act of Parliament? To the first he answered "No;" to the second point he thought an improvement was required; and to the third he said "Yes." Efficient local Acts—and some large towns had local Acts of Parliament which embraced all they required—should not be repealed; and the proposed new Sanitary Act would only give them additional powers. One of the evils of bye-laws was that there was a want of uniformity in the width of new streets; in some towns it was 36 feet, and in some 40. He could not see why the latter should not be the uniform width. The apportionment of the cost of a new street to the various owners fronting and abutting them was a great difficulty which they all felt, more especially as to corner lots, and some alteration in this respect was needed. His suggestion for effecting the alteration was, that the owner be charged only half the side frontage, and that the cost of the other half be spread over the frontages to the said street. The height of buildings was another matter which ought to receive earnest attention. With regard to the construction of houses, he thought the Metropolitan Building Act might be extended with advantage to every town. The board he represented adopted the clauses of this Act, and they had found them to work very well. The clauses in reference to large buildings in the same Act would, with regard to the erection of large warehouses, certainly have the effect of preventing large fires, as the clause under this bill proposed to limit the size of warehouses to 300,000 cubic feet; all buildings exceeding this to be vertically separated into divisions by party walls. Under the head of "Sufficiency of Space about Buildings, and Ventilation," the ventilation of buildings did not, in the writer's opinion, receive that amount of attention that it demanded; in the majority of cases, even in good houses, the ventilation was never thought of in the construction of the building, and, after it was occupied, abortive attempts were made to remedy the evil. The ventilation of ordinary buildings he held to be simple and uncostly, but it must be done during the construction of the place. Ventilation should be made compulsory, either by bye-law or by Act of Parliament. Provision was made in many bye-laws for the ventilation of small rooms without fireplaces; but why dwelling-houses should be omitted was not very clear. The ventilation of the space under walls should be enforced in every case. House drainage, which the paper next dealt with, was, as the writer said, not receiving that attention it deserved. Builders were told to lay their drains in a certain manner, and to the approval of the borough surveyor; but this over-worked official could not possibly see every pipe, and parsimonious boards did not give him the necessary assistance to ensure a rigid inspection by deputy. The ventilation of soil-pipes, the disposal and removal of excrementitious matters, and the drainage of the subsoil next the basement, were all sanitary questions of the highest importance; but we lived in an age of superficial sanitary patching, and these matters could not be effectively dealt with. He advocated the appointment of medical officers and inspectors of nuisances; and also the appointment of civil engineers, whose hands should be strengthened if pressure of work made it necessary. Their houses should be constructed on the best known sanitary principles, the house drainage well laid, and the construction daily inspected. The water supply should be good, and the refuse regularly removed. One of the greatest of existing evils was overcrowding in dwelling-houses; and power should be given to the local authorities for the prevention of overcrowding, by applying the law to houses where there was a single family, and when it was found that this single family were overcrowding their dwelling. Houses totally unfit for human habitation ought to be pulled down; and power for doing this ought to be given to the sanitary authority.

The discussion was opened by Mr. MONSON and Mr. LAWLEY.

Mr. JACOB, B.A. (Barrow-in-Furness), said a code of proposed universal bye-laws was already in print, prepared by Mr. Geo. Frederick Chambers, at present attached to the Local Government Board. He (Mr. Jacob) had suggested at the time certain difficulties in establishing a universal code, and he was sure they could not be adopted by every borough in their integrity. It introduced many provisions which would not meet with the approval of Town Councils or of surveyors. A great many new matters were introduced into the code, and many valuable suggestions were made. Many of the instructions of the Local Government Board were *ultra vires*, and involved corporations in litigation that they were not able to get out of satisfactorily to themselves.

Mr. STATON (Ryde) said that Mr. Lemon referred to the difficulty of getting efficient bye-laws passed by the council. He found the same thing in Ryde, when he was appointed some years ago. The bye-laws were old fashioned, signed by five members of the local board; and the gentleman who was the first to sign these laws was the first to break them. For endeavouring to get better bye-laws, he was cartooned in a local paper called the *Earwig*, and persecuted much in that way.

Mr. FOWLER (Salford) was of opinion that there should be no bye-laws; that the members of the council should have no discretionary power; and that a general Act should be carried out.

The discussion was continued by several members.

Mr. THORNBURN (Birkenhead) thought they were pretty well agreed that the bye-laws should be swept away, and their proceedings would be very much simplified if they could get a universal Building Act; but, at the present, he must confess that he did not see any way to work out a code of building regulations to be included in any Act of Parliament that would be likely to be completely and successfully applied to all towns. What they wanted more particularly was some general rules laid down by Parliament. There might be a difficulty in small towns of getting laws put into operation; but they ought to be compulsory, and not optional.

Mr. A. M. JONES (Ealing) suggested that they should form a committee and draw up a code of bye-laws which they thought would be satisfactory to urban and rural districts, towns, and villages, that their experience showed could be carried out. Probably they would be accepted by the Local Government Board, who would look upon it as the emanation from the minds of practical men, and might be considered better than even what Mr. Chambers could produce.

The CHAIRMAN thought Mr. Lemon struck at the root of the thing when he said that the difficulty was to deal with vested interests. The remedy was to make the duties of surveyors directory, without having to run to the board to report things. In the metropolis the district surveyors carried out the Act of Parliament. If they found an infraction, they went direct to the magistrates and insisted on the law being carried out without the intervention of boards. He did not see why a general Act should not be applied to the country, with certain modifications for rural and urban districts.

Mr. LEMON having briefly replied, a vote of thanks was passed to him for his paper.

*Sanitary Legislation and its Practical Exponents.*

Mr. C. JONES was announced to read a paper on this subject, but, owing to the advanced hour of the afternoon, he contented himself with making a short oral explanation. He said the subject of sanitary legislation had occupied the attention of their legislators. Bill after bill had been brought before the House of Commons, commission after commission had been appointed, and tens of thousands thrown away. They had had to carry out Acts of Parliament bearing upon sanitary measures, and it was now 20 years ago since a man like Dr. Lyon Playfair and Mr. Chadwick took up the question, and reported upon the position of towns in Lancashire and other places; and legislative measures, based on the recommendations of these reports, were passed. And so it went on from time to time, and they had been looking for something which would prove a panacea of all the sanitary wants of the nation. That came at last, and in the year 1872 an important Act was passed, which they hoped would have been the great remedy for all their necessities. The evidence of those who knew everything and those who knew nothing about sanitary measures was taken into account, with the exception of the men who had to carry out the matter. It was an extraordinary circumstance that not one officer—not one of the engineers or local board surveyors throughout England—was called upon to give evidence in connexion with that important measure. It was founded upon the evidence of medical officers—all respect to them in their department—town-clerks, chairmen of boards, and every one else who had anything to do with the matter; but not

the men who had to carry out the minutiæ of the affair, and who understood the working of it. The mountain was in labour, and it brought forth not a mouse, but an inspector of nuisances—one of the most extraordinary developments of legislative enactment. He believed that nothing had occurred in connexion with the legislation of the last 25 or 30 years which had had such a baneful effect on the sanitary condition of the country as that production. Why, "What's in a name? A rose by any other name would smell as sweet." The inspector of nuisances under any rural sanitary authority or board of guardians was not a surveyor, and he was not an engineer. He was a man to do what the board told him, and he was not to poke his nose into everybody's affairs. It was a matter of false economy, of putting down everything likely to increase the rates. To illustrate the point which he was anxious to take up, he had cut out some advertisements for inspectors from the *Local Government Chronicle*. One offered a salary of £75 per annum, payable quarterly, for an inspector to look after 35 parishes—something like £2 3s. per parish per annum; and he had to undertake the sanitary measures in connexion with all these parishes under the enormous power of an Act of Parliament. He had to make a sanitary inspection of the whole district, looking after their sewage and water arrangements, and in many cases 25 or 30 miles of road. Here was another case. For 19,090 acres an inspector was asked for £75 per annum. He had also one in which they advertised for an inspector for 69,000 acres, and the parishes included in it, and they offered a salary of £2 2s. a week. In another case, where there were 30 parishes in the union, where the duties to be performed were those prescribed by the Public Health Act of 1872, £80 was offered, and the officer had to provide all necessary expenses—travelling and keeping a horse at his own cost. If he did not pity the inspector, he pitied the poor horse. He had another case of 35 parishes at £75 per annum. He would like to hang the man who put that advertisement out first, because it had been so extensively copied. He had a curious case of 35 parishes, with 40,000 acres, and a salary of £75, to commence from the date of confirmation, to include all travelling and other expenses, except the books; the appointment was to be for one year only, and the officer was to do no other work. At the bottom of that was an advertisement for a porter at a workhouse, where there was a salary of £30 per annum and everything found, with some perquisites in the way of £5 10s. for shaving. There was another case, with an area of 103,426 acres, and there was £5 per annum, which would include travelling and other expenses. There was, however, a saving clause—the inspector would not be required to devote his whole time to attend to the duties of his office. He also knew a case in which an inspector of nuisances, in one of the dirtiest places under the sun, kept a beershop, and yet he had been appointed with the approval of the Local Government Board as a "practical exponent of an Act of Parliament." He trusted the time was not far distant when this institution would make its voice heard, and when these monstrosities would be thrown upon the public no longer.

Mr. THORNBURN (Birkenhead) moved that a memorial be presented to the Local Government Board, protesting against these absurd appointments.

The motion was seconded.

Mr. MONKS (a member of the Town Council of Warrington) asked whether, if all the Town Councils and Local Government Boards paid men good salaries, they could find a supply of competent men?—(VOICES: No, not at once.)—He hoped they would have patience in that matter, considering that they were on the threshold of sanitary legislation. They might trust to the good common sense and kindly feeling of local boards that when they had efficient men they would pay a good salary.

On the suggestion of the CHAIRMAN, the resolution was altered to—"That the subject be referred to the council, with the view of memorializing the Local Government Board," and carried unanimously.

A vote of thanks was passed to Mr. Jones for his remarks.

*Sewer Ventilation.*

Mr. E. B. ELLICE CLARKE, C.E. (engineer to the town of Ramsgate), read an elaborate paper on "Sewer Ventilation," in which he stated that the evidence he had obtained from nearly 100 towns showed a deplorably backward state of things as regarded the actual ventilation of the sewers. He had endeavoured to find out from the various towns what was the nature of the gases given off, and the velocity of the currents of sewer air. He asked the question in his inquiries, "Have any experiments been made by you to obtain the velocity of air in sewers, and the nature of the gases?" Out of 43 towns whose answers he had tabulated, in 28 towns no experiments had been made to determine these facts. Several engineers, however, had given him most valuable information, and the most important communication received was from Mr. J. J. Nicholson, of Sunderland. That gentleman found the composition of the sewer air to be nitrogen 81·1, oxygen 18·4, carbonic acid 0·5, with traces of sulphuretted hydrogen and ammonia. Comparing this with the analyses of other sewers showed conclusively how the gases varied in their composition. To these sewer gases must be added fœtid organic vapour and marsh gas. It was thus clearly proved that certain sewers contained a number of gases, the whole forming one body which they knew as sewer gas, a homogeneous mixture, of light specific gravity, with immense diffusive power, acting as a distinct body with its own individual characteristics. It was doubtful whether baneful gases existed at all in sewers where the temperature was kept down by constant flushing. On the other hand, there could not be the shadow of a doubt that there were miles of sewers, the construction of which was either so defective, or the peculiar nature of the sewage was such as to give off a large amount of dangerous gas. With regard to the question of how to get rid of sewage gas, they must first consider how to prevent its being engendered in the sewers. Careful attention as to the flushing of sewers, even though they might be badly constructed and ventilated, would effect a large diminution in the volume of dangerous gas. It appeared to him that to obtain ventilation in sewers a current of air at a certain rate must be established. He considered a quarter of a mile an hour would give ample ventilation, and prevent the gases accumulating in such a degree as to become dangerous. Mr. Clarke then sketched the various methods by which engineers and chemists proposed to ventilate sewers. The charcoal processes, he thought the experience of years would prove to be successful only in exceptional cases. He stated the methods in use at most of the large towns in England, and quoted the opinions of the professional men under whom the various modes of dealing with the sewer gas by charcoal deodorizing or otherwise were at work. If the opinion against the use of that disinfectant was not unanimous, it was nearly so, and it was to him quite overwhelming. It could not be denied that charcoal would effectually absorb and render harmless sewer gas, but the difficulties which attended its application, and the expense attending its use, in his mind, entirely precluded it from being used on a large scale. By far the most effective system yet adopted was the simple one of open gratings in the centre of the street. Crude it might be, yet it had well answered its purpose, and it possessed many advantages over any system that had been attempted to deodorize the gases. It was not liable to get out of repair, and from its entire simplicity was unquestionably superior to any other mode in diluting and dispersing the gas. With modification, he believed it to be the only way of ventilating our sewers.

Some discussion followed, and the plan advocated by Mr. Clarke was generally approved of.

*The Chemistry of Sewage.*

Mr. E. MONSON read a paper on "The Sewage Difficulty, including the Value and Purification of Sewage, Farmyard, and Artificial Manures." He said the sewage question was a difficulty quite unknown to our forefathers, and arose from three causes—the introduction of the water-closet, a new method of removing town refuse, and a new style of farming; while it also involved the question of the best method of collecting town refuse, as well as the best method of sewage disposal. Various plans had been proposed, and large sums of money spent in trying experiments, to purify sewage, and the conclusion come to was, that if human excrement was removed by water, there was no way of purifying the water so as to make it fit for domestic use, except by passing it through the soil. It unfortunately happened that in the neighbourhood of large towns land was of such enormous value that it could not be obtained for sewage purification, except at a great price, and it was a fair question to ask whether, in such cases, it was not a nuisance to adopt the water-closet system. All points considered, there was no method so convenient and so expeditious as water carriage for removing excreta from dwelling-houses, and its introduction into closely-populated towns had been a great gain to the public health. But it was not an unmixed blessing, for it brought noxious gases into our dwellings and polluted the air we breathed, while this new method of removing human excrement by suspension in water was the chief cause of the sewage difficulty, and previous to its introduction the sewage difficulty did not exist. The water-closet was imperfect because it wasted the valuable products of town refuse which might and ought to be employed to increase the fertility of the soil. In considering the use and value of sewage, Mr. Monson said that, as there was no demand for sewage, there was so much difficulty in disposing of it, and that the result claimed for it might also be claimed for irrigation, he concluded that sewage could not be utilized at a profit if it had to be pumped, but it might pay its expenses if utilized by gravitation, and that the attention of town authorities should be directed to its purification by filtration, and by utilization to a limited extent, as these required less land, and did not entail so much expense. Purification, and not utilization, being the main object, to perfectly utilize sewage one acre of land was required for 25 persons, but to purify it one acre was required for 1000 persons. The land was cropped in either case, whether it was used for purification or utilization. Purification was simply a matter of expense, and there was no difficulty in rendering it sufficiently pure to be turned into any river or stream not used for drinking purposes. Purification might be most perfectly effected by dividing it into two stages, dealing first with the insoluble elements, and secondly with the soluble and organic matter. The paper then referred to the disposal of sludge, farming, and the use of artificial manure.

Discussion on the paper was reserved until next morning.

The meeting then adjourned.

In the evening the members of the association attended a banquet in the Queen's Hotel. The chair was occupied by the MAYOR of Birmingham (Alderman Chamberlain) and the vice-chair by Mr. J. LEMON.

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FRIDAY, MAY 29.

The proceedings were resumed this morning in the Council Chamber, Moor Street. Mr. ANGELL, President of the Association, occupied the chair, and commenced the business by reading a paper on "The Sewage Question." He said the question presented itself in three aspects; the sanitary, which was paramount; the municipal or financial; and the agricultural aspect. Under the sanitary aspect, they were all agreed that excreta should be defecated or removed as soon as produced; but they differed immediately they discussed the best methods of accomplishing their object. The great difficulties into which they had been brought by the introduction of the water-closet system induced many to desire to revert to the primitive cesspool or the more modern midden or earth closet. Those who had experienced the advantages and the cleanliness of water-closets would retain them at any cost. The mischief in this direction was irrovocable, and the probability was that in the end the hydraulic system would prevail over the earth or midden system. Middens and earth closets were simple and effective enough in theory, but they were costly, cumbersome, and inconvenient in practice, very suitable for country houses and small villages, for gaols, &c., where there was rigid discipline and supervision, but in large towns the inconvenience and cost of cartage would be very great. The earth system was not applicable to liquids, nor should they escape the cost of sewers; there must be a sewerage system, as provision must be made for domestic and surface drainage. The Metropolitan Commissioners of Sewers abolished 30,000 cesspools, and the Metropolitan Board completed the work, and London was now the healthiest city of the world. The Rivers Pollution Commissioners suggested that, if the houses of Manchester and Salford were removed, the site would be marked by 60,000 cesspools, and they knew the sad tale of the death-rate of Salford. But they were told that in filling up the cesspools they had converted rivers into main sewers, and sparkling streams into "elongated cesspools;" that they had transferred the pollution from the land to the water. Granted; and he was inclined to think it was better that such filth should be diluted and washed away, even in their rivers, than have their towns honey-combed with it. He did not think that potable water should be derived from rivers which flowed through farmed lands and inhabited banks. If the small necessary supply of pure water for domestic purposes were derived from pure sources, the standard of purity question would be very much simplified, and many towns relieved from impossible obligations. At present the condition of the sewage question appeared to be this. On the one hand practical chemistry suggested artificial combinations and constituent changes by the action of certain agents, which were very effective, but ruinously costly. On the other hand, nature pointed to her great laboratory, wherein she employed the simplest agents to effect all necessary combinations, conversions, and reproductions. Laboratory experiments and chemical analyses had proved altogether unreliable in practice. In no one case had chemistry shown even an approach to commercial success, but they had seen heaps of unsaleable manure, and companies asking to be released from their obligations. The value of sewage was well known analytically in comparison with guano as a standard manure. When diluted, as in the ordinary condition of town drainage, about 1250 tons of liquid drainage contained the value of one ton of guano, a liquid ton of sewage containing a fraction over two pennyworth of manurial constituents, 6-7ths of which were in solution. Hence they had the problem how to recover two pennyworth of ammoniacal salts from 225 gallons of water, or the hundred and thirteenth part of a penny from a gallon. As sanitary engineers, they did not depreciate the efforts of chemical science; they intervened no obstacle, but they could not be expected to advise their clients to expend money in a class of experiments which had hitherto failed practically in every form. Where a high standard of purity was not an "absolute necessity," he could not help expressing the opinion that the original lime process, with all its defects, still held its own as the cheapest and practically sufficient. The analytical results of the lime deposit gave greater value than many of the other well-known processes. It was true the lime process did not purify the effluent sewage water, but, according to the report of the Rivers Pollution Commissioners, it removed a greater per centage of organic nitrogen than either the A B C or sulphate process—that was to say, that lime removed the most polluting properties of sewage in a greater degree than the other best known processes investigated by the commissioners. The greatest difficulty in the lime, as in all tank processes, was in drying the deposit, which quickly became a nuisance, and must be disposed of at whatever cost. In the open country it might be air-dried; it might be mixed with ashes or shoddy; it might be ploughed into the earth; or they might dry it by artificial heat; each of those processes being attended with more or less waste and cost. The great object was to get rid of it, and its complete destruction would be cheaper than any manufacture. With regard to the effluent water, he believed that if the volume of the stream into which it was discharged was large relatively to the volume of the sewage, and it was not used for drinking purposes, the lime process was sufficient. If, however, absolute purity was their aim, he believed the earth, by either the process of intermittent filtration or by irrigation, to be the best and cheapest means of attaining it; but their early dreams of profit were altogether illusory. Sewage farming might not have

been so profitable as was expected, but it had proved the cheapest and most satisfactory method of disposing of sewage, and with more knowledge and greater care might be more satisfactory in its commercial results. At all events, it was the most hopeful process.

Mr. PRANGE (of Messrs. Prange and Whitthread), then read a paper on "Whitthread's process." He said that by this process endeavours were made to cope with the sewage difficulty by keeping two objects in view—first, to produce an effluent below the standard of the Rivers Pollution Commissioners; and, secondly, to do so with a fair chance of profit. Their process consisted in adding dicalcic phosphate, dissolved in an aqueous solution of monocalcic phosphate, to the sewage as it flows from the sewers, and when the whole was well mixed, in adding milk of lime in sufficient quantities to precipitate all the phosphates, avoiding an excess of lime. There was no use in pretending to obtain value in return where chemical processes analogous to filtration were used. The object was to cleanse the sewage at a cheap rate, and when towns determined on this they must look to a certain dead loss, and be glad if the primary object were attained. The object of the first process was to produce a good manure by the sparing use of a fertilizing agent, and in doing so to render the sewage harmless by the extraction of the substances which were of value to the farmer. The object of the second process was simply to rapidly effect a complete change in the condition of the putrescible bodies—to do the same thing in a few minutes which required weeks in the ordinary course of nature, and days by filtration through land, with the advantage of doing it in all states of the weather and all seasons of the year.

Mr. LEMON (vice-president) asked what were the financial results of the process.

Mr. PRANGE said that where they had been working upon this plan the cost of a ton of manure, including the cost and interest of the plant, and the cost of pumping and chemicals, was about £1 12s. Where there was no pumping to do, and where the sewage was not so very filthy as it was where this process was adopted, the financial results would be better. He did not at all pretend, unless in exceptional circumstances, that the precipitation process would afford a mine of wealth to any town that adopted it, but it would repay the greater proportion of the expenses connected with it.

Dr. ANDERSON (Coventry) gave a sketch of the sulphate of alumina process. After inviting them to Coventry, to witness the process, he took the opportunity of correcting a few errors in what was generally received as the chemistry of sewage. He disbelieved many of the statements of the Rivers Pollution Commissioners *in toto*. Their report as to the average analysis of the sewage of towns was totally erroneous on practical grounds. Their average was collected in this way:—A definite quantity—say half-a-pint—of sewage was collected every hour for 24 hours, at the end of which time the half-pints were mixed together, and a sample of the mixture was taken as the average of the sewage. Now sewage varied immensely in composition, and it was foulest when the flow in the sewers was greatest. From analyses he had made at Coventry, it appeared that at six o'clock in the morning the flow was at the rate of 47,500 gallons per hour; at nine o'clock 67,500; and at twelve o'clock noon 80,000, and, bulk for bulk, there was not half the amount of organic matter in it at six as at twelve. Any deductions as to average arrived at from calculations made on the principle adopted by the commissioners were totally erroneous, because they very much underrated the foulness of sewage. The commissioners said that six-sevenths of the manurial constituents of sewage were in solution. He denied that. He had never been able to discover more than about one-sixth of the actual manurial property of sewage absolutely in solution. In distilling sewage chemists applied heat, which converted a good deal of the suspended nitrogenous matter into ammonia. This matter was not in solution before, but the chemists made it so. After the application of the heat, and the addition of substances rich in oxygen, the chemists used the Nessler test to determine the quantity of nitrogen in the mixture. Six-sevenths of the matter they put down as being in solution was never in solution till the chemists made it so. He did not believe in any bare theoretical or highly scientific facts with respect to the sewage question; they must not look entirely to the chemists to solve the sewage question; those who represented the ratepayers must consult the evidence of their own senses, and depend less upon chemists and Royal Commissioners than had been the fashion up to the present time. With regard to the sulphate of alumina process, which he was carrying out at Coventry, he said he obtained the sulphate by treating shale with sulphuric acid. The proportions were—alumina (that was peroxide of alumina), 14·0; sulphuric acid, 32·7; residue, insoluble, 43·64; loss, consisting of moisture and organic matter principally, 9·66. He dissolved this, and removed the residue and the organic matter (the 43·64 and the 9·66). The remainder was in solution, and flowed in that state into the sewage as it passed through a part of the works. The sewage was then stirred up by means of an agitator, and passed on into the lime works, where it received a small portion of lime. The lime was not used as a defecator, but only to set free the alumina. After this, the sewage flowed into settling-tanks, and after ten days the deposit was swept into a mud chamber, and dried in Milburn's machines as manure. He should have stated that before being treated with chemicals the sewage passed through Latham's extractor. The cost of the production of the manure was about 30s. a ton. The effluent was practically clean, and as conducted at Coventry the whole process promised to pay expenses and yield a profit. About half the total nitrogen was removed with suspended matter. They proposed to run the matter through a filter-bed before being discharged into the river.

In reply to questions, Dr. ANDERSON said that the sewage at Nuneaton very nearly paid the working expenses, but there was heavy pumping to be done there. The price of the manure was about £2 per ton there.

Col. JONES then read a paper on his mode of treating the sewage of the small town of Wrexham. The town was sewered in the ordinary manner, and the sewage flowed down to his farm. Overflows, or connexions with a brook running through the farm, prevented his being overburdened with excess of liquid, only so much being retained as the tanks on the farm could dispose of. He then lost a good deal of sewage, especially during heavy rainfall. He had come to the conclusion that the system of keeping sewage and rain water distinct and separate was to be desired. He was sometimes told that artificial flushing of the sewers would be required if the rainfall was carried off separately; but water was cheap and readily applied, and it was better to have the flushing under control. Many urged as an objection to the double system the question of expense, but they forget that the rain water would be carried directly to the natural watercourses, and that the pipes required would be smaller. He instanced Mr. Blackburn's camp farm at Aldershot, as an example of the success of the separate system, and said he saw no reason why a great part if not the whole of the rainfall should not in all cases be sent direct to the natural watercourses. Turning to his own farm, he explained that after the sewage sludge had remained a sufficient time in the tanks to allow the suspended matter to fall, he cleared out the deposit, and placed it on the ground for manure. Its effects were superior, weight for weight, to good farmyard manure, and he sold as much as he pleased at £3 per ton, which more than repaid the expense of emptying the tanks. In conclusion, he referred to a new patent for dealing with town refuse; by making charcoal of street sweepings, and deodorizing the collections in the Rochdale pans with it, thus forming an excellent manure. The patent is being worked by the U. C. and S. Co., of Manchester. In reply to questions, Mr. Jones said the population was about 9000; but only 3000 or 4000 were connected with the sewers. His farm had an area of 84 acres, and the rent of it, together with the sewage, was £350 a year. The sewage came direct to the farm by gravitation; and the subsoil of the farm consisted of sand and gravel.

Mr. TANNER (late a partner of Professor Way of the Government Rivers Pollution Commission) gave a description of the phosphate process. He said if they took irrigation as a means of purifying sewage less area was required for that purpose if the sewage was partially disinfected or precipitated previously, and, as a rule, greater profit would accrue. In the phosphate process the first operation was the mixing of prepared phosphate of alumnia, which had been treated with sulphuric acid, with the sewage. In three or four minutes the action of the phosphate appeared to be thoroughly complete. It had the effect of coagulating the fœcal matter in the sewage. After the action of the phosphate was complete, milk of lime was added to bring down from the clear water any phosphoric acid or organic acid remaining in it. The sewage then passed into settling-tanks, in which the water was kept still by peculiar frames resting on the surface. By adopting these frames, the inflow and efflux were continuous. If necessary the effluent water could be passed through filter-beds. The character of the deposit was one that admitted of a ready sale.

In reply to questions, Mr. TANNER said that the selling value of the manure was nearly as much as the expenses of producing it. The phosphate alone cost about £3 5s. per ton, and the manure sold at about £4 per ton.

Major-General SCOTT then described the cement process. In introducing the subject he said they were evidently far in advance of their position in former years. He thought they were all agreed that there was only one perfect way of purifying sewage, namely, by filtration or irrigation, and he thought they also agreed that towns must pay for getting rid of their filth. Proceeding to speak on the subject he had to introduce, he said that large towns had the option of doing two things with their sewage. They might dig it into the land, or attempt to make some profit out of it by a different treatment. Some made it into a manure; some, he believed, advocated the burning of it; and they might convert it into cement. He went on to describe and advocate the cement process, but as it has been frequently explained in our columns it is unnecessary to follow the gallant gentleman in his arguments. The Birmingham Corporation had tried the system, and he thought he might say that the whole of the cement that had been made had been used in the corporation works, and at all events he might say it had done far better than lime would have done. If they only get the price of lime for it, the conversion of it into cement would be a wise course to adopt. When the process was applied at West Ham, he was desirous that they should send it out as agricultural lime. A report was prepared upon the subject, and the value of the cement was said to be £1 per ton beyond the value of the lime itself. Wherever the lime was used, the value of it might be increased by means of phosphate of lime. Although he was a strong advocate of the lime process, he was by no means convinced that they would not be wise to adopt the water-carriage system. He was quite certain that no one who had experienced the comfort of the water-closet system would be willing to give it up. He did not, however, think that manufacturers would be found ready to convert their cesspools into water-closets; and, on the other hand, he did not think they would be easily induced to adopt the pail system. He believed that if they were to ask any gentleman in that room what he would do with reference to the sewage question, he would reply, "I will wait and see what others do." If they were all to say that, what would be the result in 20 years time? They might depend upon it, the time had gone by when they could get companies to come forward and take up the matter. Towns must take up the subject themselves, and then, no doubt, contractors would come forward; but they could not expect any inventor to come forward, however skilled he might be, and say he could do this or that at so much a ton.

In reply to questions, General SCOTT said he believed the cost of grinding at Birmingham was 3s. 6d. per ton. There were about 33 bushels in a ton, and it would be £2 5s. per ton. His belief was that with a proper system of drying, they should be able to make the cement for £1 10s. per ton. They could never expect to make a cement equal to Portland cement from sewage. A series of blocks of cement were made some time ago. Alderman Avery and other gentlemen tested the quality of the different specimens. They had five kinds of lime, and a mark was placed upon each; and to his surprise the gentlemen agreed in putting "No. 1" upon the sewage cement.

Mr. FOWLER said that sewage contained a large amount of common salt, and it appeared to him that sewage would therefore be materially affected by the weather. Would the sewage cement be suitable for plastering rooms?

General SCOTT said he had a room in his house plastered with the cement, and had not found the least dampness arise from it. He was of opinion that the cement would not be affected by the weather.

The next subject for discussion was "Milburn's Drying Process."

Mr. MILBURN said they could all hope that the discussions which had taken place from time to time amongst the members of that association and other bodies would help them to extricate the vexed question of the utilization of sewage from its present unsatisfactory position. A great difficulty with which they had to deal was sludge, so as to convert it economically into manure. By the process he had to introduce to their notice the difficulty had been in a great measure solved. At Coventry, where the machines had been tried, the cost of producing dry manure from sludge was somewhere about 7s. or 8s. a ton. One of the objects of the Town Manure Company was to combine liquids with solids. They wanted the liquid for the large amount of ammonia that was contained in it, and the solids were used as the base. In West Bromwich the system had been successfully tried; and only a week or two ago the company sold all the manure they could make at the high price of £8 per ton. He believed the Bilston authorities paid the company a certain subsidy, so satisfied were they with the system of the company.

The PRESIDENT said he was sure the association felt very much obliged to the gentlemen who had given them so much information as to the various processes which had been adopted for dealing with sewage; he thought they were entitled to the best thanks of the association.

Mr. MONSON expressed himself in favour of applying sewage to the land. Instead of dealing with sewage by chemical means, they would do better to pass it through the land.

Mr. GRINDLE said he firmly believed in the lime process.

The VICE-PRESIDENT (Mr. Lemon) thought it was the fault of gentlemen who wished to save their boards money, that the settlement of the sewage question had been delayed. As a rule, boards were waiting to see how cheap the thing could be done, or to see if they could get some one to do the work for them. He thought the time had arrived when it would be necessary for boards to subsidize companies or do the work themselves. He did not think that sewage could be made to give a profit except under very exceptional circumstances indeed. Birmingham had done more to elucidate this question than any town in England. He had gained much valuable information from a report issued by the Sewage Committee, and he wished to express his thanks to Alderman Avery and the Sewage Committee for the efforts they had made in the elucidation of this difficult problem. In reference to the late proceedings in Parliament, he challenged Sir Robert Peel or Sir Charles Adderley to produce a single case in which a report passed by a select committee was pushed to a division in the House of Commons. He strongly condemned the action of the honourable gentleman in question, and characterized the proceedings in the House of Commons as being disgraceful. The scheme which had been prepared was the best that could have been drawn up for dealing with the question. The result of the action of the honourable gentleman had been that the settlement of the sewage question had been seriously delayed. In dealing with the sewage they should try, if possible, to make a small profit, or to get enough to pay expenses, or they must get rid of it as cheaply as possible. He thought the only way in which they could obtain any profit was by applying it to the land. In towns where there were 10,000 inhabitants a field of five acres would be large enough for the purpose. He

disagreed with General Scott as to the wisdom of making cement from sewage. He could not really see how they could expect to make a good cement from sewage deposit or the washings of the streets. He was an advocate for a separate system of drainage for sewage. If the surface drainage could be put into rivers, what on earth was the good of putting it into the sewers, thus increasing the sewage difficulty. The sewage difficulty was enormously increased by the large quantity of surface water that ran into the sewers.

Mr. JONES said that, whilst he was in favour of a separate system, he would confine it to the large quantity of water that came from the roads, and not include the water that ran from the roofs of houses.

Mr. DUNSCOMBE thought many engineers present believed that the only means of dealing with sewage was by irrigation over a large area, or filtration over a small area.

Dr. WILSON said it was satisfactory to find that people were beginning to discuss the question in a much more temperate fashion than had been the case hitherto. It appeared to him that the sewage question, like politics, had all along been made too much a party question. Various systems had been advocated, and the usual course adopted by the advocates had been to begin by vilifying every other system. The consequence had been that a great deal of distrust had been created in the public mind in reference to the matter. Many of the processes had been made Stock Exchange speculations, and had not therefore been put before the public so honestly as they might have been. Looking at the question from a purely medical point of view, he believed the water-carriage system was the best system, and he had no hesitation in recommending the adoption of water-closets in all towns where there was a good water supply.

Mr. PRITCHARD (local secretary, Warwick) said he had found great advantage result from having a duplicate system of sewers. At Warwick the surface water was partially taken to the river, and the work of dealing with the sewage at the outfall was rendered much easier in consequence. He also spoke in reference to the treatment of sewage on Lord Warwick's farm, and he contended that it was possible to make a profit from the produce of a sewage farm. He also spoke of the Warwick sewage farm; although it did not pay the whole of its expenses, still produce had been sold in Birmingham market from small portions of land, specially prepared, at the rate of £100 per acre (gross). He also contended that there was not any great difficulty in dealing with the sewage sludge. He advocated precipitation and irrigation, or downward intermittent filtration, combined, as the most effectual method of dealing with the disposal of sewage.

After a few remarks from Mr. FOWLER,

Mr. BUCKHAM (Ipswich) thought contractors ought to be very careful and consider the matter well before they resolved to enter into irrigation schemes of any kind. He had great faith in the purification of sewage by filtration through land, as practised at Merthyr Tydvil.

General SCOTT having briefly replied,

The PRESIDENT said that his opinion was that, if they required absolute purity, they must go to the land. He thought that towns must not expect, under any circumstances, to make any profit out of sewage. It was not the fault of corporations or of the association that they had been led to expect a profit, but it was the fault of the Government officials, who had gone about the country talking of extravagance, and condemning them for throwing away what might be turned into a mine of wealth The Government officials had led them into that great error, and they ought to assist them in getting out of the difficulty. He concluded by thanking the mayor, Alderman Avery, and the corporation generally for the kindness they had shown the association.

*Gas Street Lighting.*

A paper was read upon this subject by Mr. T. A. SKELTON. He referred to the great waste of light which attended the present system of lighting the streets. He pointed out that by the use of "catoptric" reflectors fixed in a lamp, the light radiating upwards would no longer be wasted, neither would it be concentrated below, but it would be thrown forward, and dispersed or concentrated as might be required along the usually dark interval between the lamps. He illustrated his paper by reference to a specimen of a "catoptric lamp" and diagrams.

The VICE-PRESIDENT said that in High Street, Southampton, six or seven of the "catoptric lamps" had been erected, and the street was much better lighted than it was formerly. If corporations would reduce the quantity of gas used in the street lamps from 5 to 4 feet per hour, and adopt the new lamps, about 20 per cent. of the cost, or £2000 a year, would be saved, and the streets would be better lighted than at present.

The business of the meeting being concluded, the PRESIDENT conveyed the thanks of the meeting to the corporation for their courteous reception of the association, and the granting of the use of the council chamber.

Alderman AVERY briefly acknowledged the compliment.

On the motion of Mr. E. CLARKE (Ramsgate), seconded by Mr. RICHARDSON, a cordial vote of thanks was accorded the president for his conduct in the chair.

The PRESIDENT briefly responded, and proposed a vote of thanks to Mr. Till (borough surveyor), and to Mr. Pritchard (local secretary to the association), for the services they had rendered the conference.

Mr. PRITCHARD and Mr. TILL having acknowledged the compliment, the proceedings terminated.

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SATURDAY, MAY 30, 1874.

*Visit to Saltley Works.*

This morning, a number of the members of the association paid a visit to the Birmingham Sewage Works, at Saltley. The party were received at the Saltley Works by Alderman Avery, chairman of the Sewage Committee, and Major-Gen. Scott. Under the able guidance of Mr. Avery, the tour of inspection was at once proceeded with. The mode of dealing with the sewage is very simple, and Alderman Avery's clear explanations of the different parts of the system enabled the visitors to thoroughly comprehend it. Saltley Works are about two miles and a half from the centre of the town, and the sewage is conveyed in the usual manner—street drains converging into one main sewer—by gravitation. About a quarter of a mile above the settling-tanks the sewage receives a quantity of milk of lime, which is prepared in works situated at the side of the sewer. These works consist of two large slaking tubs, in which the lime is plentifully mixed with water and stirred by steam machinery until it acquires a proper and uniform consistency. The tubs are supplied with taps near their upper edge, and from these the lime and water run off into a long trough communicating at the opposite end with an opening in the sewer. The milky-looking substance falls into the black stream from an apparatus which divides it into several jets, thus spreading it as widely over the sewage as possible. By the time the tanks are reached the lime has been thoroughly intermixed with the sewage. The lime is used for the purpose of accelerating precipitation at the tanks, and for arresting the progress of putrefaction. About twelve tons per day are consumed at Saltley. As explained by Alderman Avery, lime does not prevent, it only retards, putrefaction for a limited period. That limit, however, is sufficient to enable the precipitated sludge to be dried and disposed of as may be required. There are two series of settling-tanks through which the sewage has to flow. In the first the grosser parts of the sludge are deposited, and in the second the finer particles are allowed to settle. The first series comprises two tanks which are used alternately every fortnight, that being the time necessary to fill and empty one. The second series should comprise four tanks, but as yet only one has been made. The placidity of the water in the tanks is secured by simple but very effective means, and the inflow and outflow goes on steadily and regularly. The efflux from the second tank as it flows into the Tame is beautifully transparent, but it is not quite free from a colouring matter believed to be blood from the slaughter-houses. The sludge from the tanks is disposed of by digging it into the land. It is raised by bucket pumps from the bottom of the tanks to moveable wooden troughs, which carry it to any part of the farm. The troughs discharge themselves into square sludge-beds, the walls of which are formed with turf built up to a height of 18 or 20 inches. When one bed is full, the end of the trough is turned on to another, and so on. In these the sludge lies until it is pretty dry, when it is dug into the ground by manual labour. The land is planted with cabbages or other green crops, which grow luxuriously upon the well-manured soil. It is not intended to use the same land for digging-in purposes more than once every two years, but it is believed that it may receive a dose every year with safety.

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## AIR GASLIGHT COMPANY, LIMITED.

An Extraordinary General Meeting of the Shareholders of this Company, convened under the 49th section of the Articles of Association, in pursuance of a requisition signed by 40 shareholders, was held at the London Tavern, on Tuesday, June 2—Sir JOHN MURRAY, Bart., in the chair—"for the purpose of considering the desirability of forming a new board of directors and requesting the present directors to retire."

The SECRETARY having read the notice,

The CHAIRMAN said the directors, having in view the number of the requisitionists, had felt that, although those gentlemen might not, perhaps, represent the majority of the shareholders, they (the directors) had no desire to retain office against the wish of even a section of the shareholders. He had now to state that all the directors, with the exception of three, had desired him to place their resignations at the disposal of the meeting. One of the three gentlemen alluded to—Mr. Jones—was absent when the matter was under discussion by the board, and, though he (the chairman) had no authority to say so, he had no doubt that Mr. Jones would adopt the same course as the majority of the board. The second gentleman—Mr. Singer—was now present, and would answer for himself. The third gentleman—Captain Lord—the managing director, who, from the first, had retained 500 shares in the company, besides which his friends had paid several thousands, had felt that his duty would not allow him to retire so long as he could be of any service. If, however, the new board should be of opinion that the presence of Captain Lord would not conduce to the welfare of the company, he would willingly bow to their decision. Before handing in the resignation of himself and colleagues, he (the chairman) thought it was only an act of justice to the gentlemen of the board to state that they had no private motives to serve in the steps they had taken. They had all invested their money, believing in the merits of the invention, backed up as they had been by persons in high authority. It appeared, however, that many shareholders entertained different views to the board, and all he could say was, that if the expectations of the committee and Mr. Harrison turned out correct, no one would rejoice more than the members of the board. And he had the authority of his colleagues to say that, though out of office, they would, if requested, give to the new management all the assistance in their power. The chairman concluded by tendering the resignation of himself and the other members of the board, with the exceptions previously mentioned, and moving that the resignations by accepted.

Mr. SINCLAIR thought that before proceeding further it would be convenient to hear why the three gentlemen referred to by the chairman declined to retire.

Mr. SINGER said his only reason for not following the course adopted by the majority of the board was that he considered that he owed something to himself and something to his friends who were shareholders, in consequence of his connexion with the undertaking, and until he could find that it was to the interest of the company that he should retire, he was bound to maintain his position. He did not think the course pursued by the committee of investigation was exactly what it should be. The primary object of their appointment was to ascertain the value of the inventions belonging to the company; and if they had found out that the want of success was the absence of good management on the part of the directors, he would have resigned at once. But they had not done so, and therefore he did not like to desert his own interests and the interests of his friends till he could see that he was no longer useful.

Captain LORD said he was a very large shareholder, holding 500 shares, and his friends and relatives had put more into the concern than any other persons. It was only due to them to say that they wished him to retain his position as long as he thought it was to the interest of the company he should do so. And though he should be ready, if the new board did not desire to retain his services, to receive his discharge from them, till then he thought it would be right and proper to remain at his post.

Mr. SINCLAIR said that he was of opinion the company had a good property, and that if they had had an energetic body of directors they would have been in a better position. He should therefore move—"That it is desirable to form a new board of directors, and that the present directors (not only those who have tendered their resignation, but the whole of them as a body) be requested to retire.

Mr. MAXTED seconded the motion.

Rev. Mr. DESMOND said he should propose an amendment. The shareholders entrusted the committee of investigation to find out not only whether there was any value in the patents, but whether there was any money remaining out of the £114,000 which they had subscribed to carry out the invention. The committee had not completed their commission; they had examined into the first patent—the one upon which the prospectus was built—and he might tell the meeting that their report upon it would not be very favourable. But he (Mr. Desmond) was not willing to oppose Mr. Harrison, who told them that he had another patent which, if carried out, would enable him to return a good dividend to the shareholders—that patent belonged to the company. He (Mr. Desmond) thought it quite necessary that an investigation should be made as to the promotion of the company, and the expenditure of the shareholders money. He did not mean to say that any of the directors were under reprehension in consequence of these remarks; but it was a very hard case that £114,000 should have been expended without any result, and, therefore, he thought it right that an inquiry should be made to ascertain how this money had been applied. He had moved in committee that an accountant be called in to investigate the monetary affairs of the company, so that it might be known whether money had been injudiciously expended in experiments after it had been stated that experiments had been already satisfactorily made; also whether the shareholders could recover any promotion-money. He received no support to that proposition in committee, but the directors, like honourable men, had expressed their assent to such an inquiry. Under present circumstances, therefore, it was premature to ask the members of the board to retire, and he should move as an amendment—"That this meeting do stand adjourned till the 23rd inst., in order that the committee of investigation appointed on the 24th of January may make a report to the company as to the value and prospects of the patents, and as to the manner in which the company was promoted and the money expended." There was not a farthing left of all the money paid for the development of the patents, and it was clear, therefore, some investigation should take place.

Dr. BURNE seconded the amendment.

Mr. DOLMAN said as chairman of the committee of investigation he opposed Mr. Desmond's suggestion for inquiring into the accounts of the company, and the way in which the money had been expended. He did so for this reason: he conceived that the material portion of the mission of the committee was to inquire into the value of the property of the company, and he took means to do so. That ground had been gone over, and it would be a work of supererogation to go over it again. The reason why the committee took fresh action at their last meeting was that their report was not considered as satisfactory as they

should like to present it, and they sought to have an enlargement of their powers, it being understood by the committee that Mr. Harrison was to obtain the use of certain gas-works for the purpose of elucidating the principles involved in his patent. Those works the committee had been told were forthcoming immediately.

The amendment was then put to the meeting and negatived, and the motion carried by a considerable majority.

Sir J. MURRAY and the other directors, with the exception of Mr. Singer, hereupon left the room, and a resolution was adopted by the meeting, calling upon Mr. Dolman to take the chair.

Mr. SINGER asked in what position the company now stood. He doubted whether, under clause 87 of the Articles of Association, it was competent to the meeting to take any steps on the present occasion.

The CHAIRMAN said Mr. Singer was *de facto* and *de jure* no longer a director.

Mr. STARKEY, the company's solicitor, said it appeared to him that it was rather doubtful whether, having regard to the terms in which the meeting was called, they could now proceed to elect new directors.

The meeting, however, proceeded with the appointments, and Mr. SINCLAIR moved—"That the following gentlemen be appointed directors:—Mr. F. W. Dolman, Mr. R. Abbott, Mr. C. W. Harrison, Mr. A. Greaves, and Mr. J. W. Wood; and that, until a dividend of 10 per cent. be paid to the shareholders, the directors fees shall be reduced to two guineas to the chairman and one guinea to each of the other directors; and that the services of these gentlemen as members of the committee be deemed as merged in their office as directors, with an instruction to continue their inquiries with or without the other members of such committee."

Mr. C. KING seconded the motion.

A shareholder proposed to add Mr. Desmond's name to the list of directors.

Rev. Mr. DESMOND said he should be very glad to help the directors in any way, but it was too much to ask him to join the direction of a company the origin of which he did not approve.

Mr. ELLERS moved as an amendment—"That the committee already appointed be requested to wind up our affairs as quickly as possible." He thought the late directors would have carried on the affairs of the company satisfactorily if they could. As they had not done so, he regarded those affairs as desperate.

Dr. BURNE said it had been thoroughly proved that the patented invention which they had bought was of no value at all, and that it could not be used for any practicable purposes. There had been a lighting up of the Crystal Palace, and such like tomfoolery, but to carry on the concern any longer was throwing good money after bad, and every one present would have to pay double.

The motion for the election of the directors named was, after some further conversation, put and carried.

Mr. SINCLAIR asked whether the meeting was in a position to take any steps towards the withdrawal of the petition to wind up the company.

The CHAIRMAN said it was not.

Mr. STARKEY: The petition was presented by a portion of the directors *qua* shareholders.

A SHAREHOLDER: It ought not to have been presented.

Mr. STARKEY: When you have had your last £1 per share called up and spent you will say, "What a pity we did not agree to the petition." When you know as much as I know now you will agree with me that never was a petition presented more in the interests of shareholders than this was, and when you have lost your last sovereign you will say, "What a pity it is."

A vote of thanks was then given to the chairman, and the proceedings terminated.

## SEWAGE UTILIZATION BY IRRIGATION AND INTERMITTENT FILTRATION.

The drawings annexed* represent the "Self-acting Sewage Regulator, or Automatic Sewage Filter," which has been patented by Messrs. J. Bailey Denton, C.E, and Rogers Field, C.E. The object of this invention is to regulate automatically the quantity of sewage or other liquid which may be applied to land, either for the purpose of utilization or purification.

* These drawings are reproduced from "Morton's New Farmer's Almanack," by permission of Messrs. Cassell, Petter, and Galpin.

One of the most prominent difficulties which presents itself in the utilization of sewage is the very different quantity which is discharged from sewers at different times. In many towns and villages the flow will be diminished at certain periods to a mere dribble, while at other times there will be a copious discharge.

Hence, as it is essential to economy in sewage farming that the crops should receive only that quantity of sewage which will produce the most fruitful growth, and as it is equally essential to success in intermittent filtration that the soil used to purify the sewage should receive only the quantity which it is capable of purifying, it becomes almost a necessity to have a means of regulating the quantity of sewage to be dealt with.

"The Automatic Sewage Meter" performs this service in the most simple and perfect manner, during the night as well as during the day, and without any supervision. The sewage is made to flow into a tank of such capacity that when the liquid rises to a given level the tank holds the precise quantity it is desired to deliver to a certain area of land at one time. This tank—called the "meter-tank"—is provided with a syphon outlet, which is brought into action as soon as the liquid rises to the given level. When this is reached, the liquid flows out of the tank, through the syphon, and continues flowing until the level of the liquid in the tank has fallen to the inlet mouth of the syphon, when air is drawn or admitted into the syphon, and the discharge ceases. The sewage flowing into the tank then commences to fill it again—slowly or quickly, according to the rate of influx—and, as soon as it is full, the automatic discharge will be repeated, and the liquid can be applied either to the same area of land or to another, as desired.

The coarser matters floating in the sewage are intercepted in a separate chamber, called "the intercepting-chamber," before the meter-tank is reached, —the finer particles being carried forward with the liquid through two strainers, marked E and F, into the meter-tank.

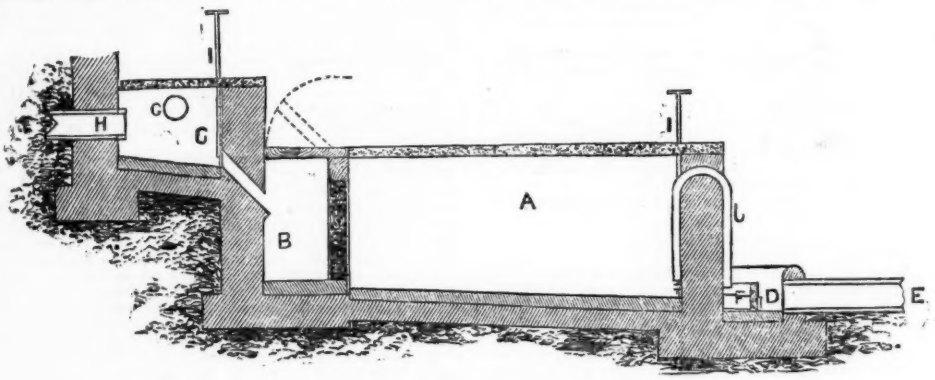
If it be desired to effect a precipitation of these finer particles, the space in the meter-tank below the inlet mouth of the syphon is increased in depth, so as to form a receptacle for any amount of deposit which it may be determined to precipitate and consolidate. In such case the space *above* the inlet mouth of the syphon will be occupied by clarified liquid, to be discharged on to land automatically by the syphon, as already described, while the space *below* the said inlet mouth will serve as a receptacle for the deposit, means being provided for draining off the liquid with which the precipitated particles are mixed, so as to allow of the consolidation of the deposit for removal. While this treatment of the solid portion is going on, the sewage is diverted into another meter-tank.

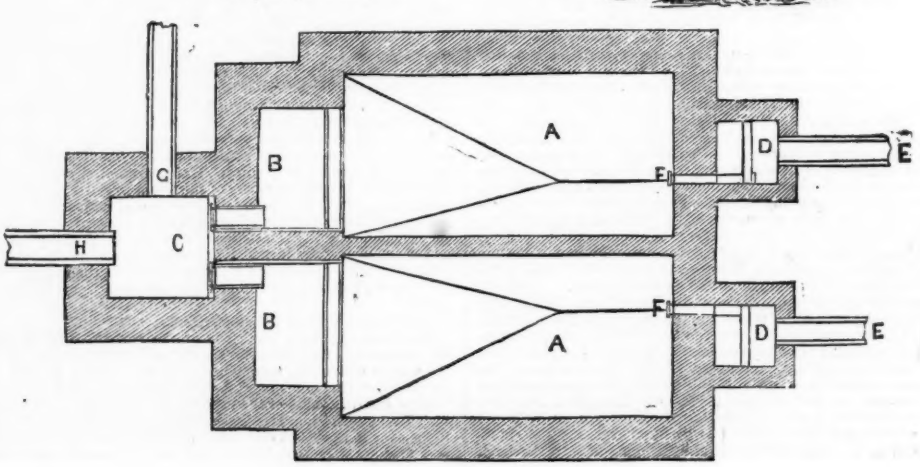
The meter-tanks are multiplied in number according to the quantity of sewage under treatment and the use to which the precipitated matter is to be applied. Where the quantity of deposit is trifling, it can be flushed out from the meter-tank periodically without consolidation, and applied directly to the land.

Between the mouth of the sewer, H, from the town, village, or mansion, and the "meter-tank," there are two chambers, the first, C, called the "sluice-chamber," in which are as many outlet-pipes, with sluices attached, as there are meter-tanks, by which the sewage can be let into one or other of the meter-tanks as desired; and in this sluice-chamber there is also fixed a storm overflow, G, which at times of great downfalls of rain will dispose of any surplus liquid the meter-tank will not take. The other chamber, B, is called the "straining-chamber," the object of which is to intercept, separate, and retain the coarser particles, and allow the remainder to find its way into the meter-tank, A, through a double grating, with coarse filtering material placed between to help the straining.

The automatic sewage-meter is applicable to towns of all sizes, but it will specially commend itself in small towns and villages, as well as in isolated country mansions, asylums, hospitals, schools, and other public buildings, where the flow of sewage is not only variable, but at times so small as almost to prevent its even distribution over land.

No night labour is necessary. Before leaving the land, the man in charge of the sewage "sets his stops" in the carriers and furrows so as to secure the even distribution of the next discharge of sewage over the precise area to which it is intended it should be applied.



The simplicity of the invention will be manifest from this description, and it will be seen that, in addition to regulating the quantity of sewage automatically, and in the most perfect way, the syphon delivers the sewage in precisely the manner most suitable for irrigation or intermittent filtration—viz., at a gradually decreasing rate of discharge. Thus, at the commencement of the action of the syphon, when the carriers are empty, the land dry, and the absorption of sewage rapid, the discharge is rapid; and at the end of the action, when the carriers are full, the land wet, and the absorption of sewage comparatively slow, the discharge is slow.

The following advantages are also secured by the Automatic Sewage Meter, viz.:—

*Economy.*—In construction and first cost—in space, compared with the old system of filtering-tanks—and in labour and supervision, as both special attention and skilled labour are rendered unnecessary by the automatic action.

*Durability.*—The apparatus for automatic discharge being without moving parts, there are only the valves or slides that can wear or get out of order.

*Absence of Nuisance.*—The sewage being drawn off frequently, is not liable to putrefy.

## THE PROPOSED PURCHASE OF THE TUNBRIDGE WELLS GAS-WORKS BY THE TOWN.

This question again came on before the Town Commissioners on Wednesday last, the Gas Bill Committee having presented the following report:—

The Gas Bill Committee have to report that, in answer to their proposal on behalf of the board that the company should insert clauses in their bill for the sale of their undertaking on terms to be ascertained by arbitration, the following communication was received on May 18, 1874:—

"*Gas Company's Office, Tunbridge Wells. Jerningham Place, Mount Sion, May 16, 1874.*

"Dear Sir,—I am instructed to forward you the following copy of resolution which was unanimously passed at a meeting of the shareholders of the Tunbridge Wells Gas Company held this evening.—I am, dear sir, yours truly, "JOHN READ, Secretary.

"Mr. Thos. Lewis, Clerk to the Tunbridge Wells Local Board."

Resolved—"That the shareholders are unwilling to sell their property to the local board, and decline to authorize the introduction into the present bill of any clauses enabling the board to purchase the gas undertaking."—In consequence of this determination on the part of the gas company to maintain and extend their present monopoly, and to persist in their scheme at the High Rocks Valley, it appears to the committee that the board have no other course than to continue their opposition in the House of Lords. With that object the petition already sanctioned by the board has been presented to their lordships House, with a prayer to be heard by counsel against the bill, and it is understood that a like course has been taken by the lord and freehold tenants of the manor, as well as by Mr. Heugh. A petition has also been presented against the bill by the principal landowners outside the local Act district, who complain that their interests and property will be prejudicially affected by this attempt to destroy the attractiveness of the High Rocks Valley.

Mr. BROWELL, in moving the adoption of the report, said they had now been told that the northern was far the better site; that Mr. Heugh had obtained his *locus standi* to appear before the Lords committee; and that, from what he heard, the gas company would have a far different opposition to encounter than they had before the committee of the House of Commons. They would have a petition against the bill from the lord and freehold tenants of the manor, and also from 17 landowners.

Mr. SHARP seconded, and expressed his surprise at the gas company refusing to sell the works to the town, when they had such an influential gentleman as Mr. Delves on the directorate, who had consistently and persistently stated his opinion that the town should have the works.

Mr. DELVES said mention had been made of a petition from the lord and freehold tenants of the manor, but he denied that any such petition had emanated from that body. He, as the senior steward of that body, knew this. There might be a petition from the lord of the manor and individual members of the body, because it was the easiest thing in the world to get up these petitions; they only wanted two signatures. The shareholders meeting had been referred to, and he did not hesitate to say that some of the shareholders present were influenced by the remarks made by Mr. Browell. Because the gas company had arrived at that state that they could not, without a very great outlay and very considerable disadvantage, remain where they were, Mr. Browell said therefore, "We will not offer to give you so many years purchase on your dividend; we will offer to take you by valuation." The impression was that this was a favourable time for the board, because, of course, it was an unfavourable time for the gas company to sell.

Mr. BROWELL: Nothing of the kind.

Mr. DELVES was, however, satisfied that the gas company of Tunbridge Wells had got so good a case that he did not for a moment fear that the opposition would be successful. He entertained the opinion for years that it would be well for the town to buy the gas-works. But when he saw how the sewage outfalls farms had been muddled by one part of their body, and that of the Sewage Outfalls Committee six were members of the Gas Bill Committee, he dreaded, as a very considerable gas consumer, the result. Nor could he compliment the Water-Works Committee on the way they transacted their business, and he did not believe that the local board could carry out gas-works in the same way as a paid directorate who were immediately responsible to the shareholders. He could not imagine anything more fatal to the town than that the gas-works should pass into the hands of those six gentlemen he had referred to. If they did, the consumers might bid farewell to any hopes of a reduction in the price of gas. They were told they were going to get immense profits, but so they had been told with respect to the sewage farms; but now they heard of something in an opposite direction. Therefore he did not hesitate to say that this board would act contrary to the best interests of the consumers of Tunbridge Wells if they ever took the gas-works into their hands.

Mr. BROWELL replied at some length, and the report was adopted.

## NEWCASTLE-ON-TYNE GAS SUPPLY.

At the meeting of the Newcastle Town Council, on Wednesday last, Mr. BARKAS moved—"That the Gas Committee of the corporation be instructed to inquire into the general complaints respecting the alleged deficient quantity, impure quality, and increased registered consumption of gas throughout the borough, and report upon the same at the next meeting of the council." In support of his motion, he stated that a great and apparently well-founded complaint existed among the gas consumers of the borough with reference to the quantity, quality, and registered consumption of gas. The number of complaints had reference particularly to the quality of the gas and to the quantity for which they were charged. He thought he could show that the quality of the gas had been decreasing for three years, and that he could account for the decline, and also of the excessive registered consumption. He had no faith whatever in the theory that was very common, of the gas managers forcing air into the pipes, with the view of increasing the apparent consumption. Such a policy would be utterly suicidal, because the introduction of air to the extent of even 6 per cent. would reduce the illuminating power of the gas 50 per cent., and no sane man would adopt such a course; nor had he any belief in the reputed occult means that were supposed to have been adopted for the purpose of forcing the meters more rapidly. The chief and best-founded complaint was as to the quality of the gas, more particularly its illuminating power. He could show, from tables furnished by their own analyst, that the illuminating power had been decreasing. In 1871 it was 15·5 candles, in 1872 it was 15·1, in 1873 it was 14·7, and in 1874 it had sunk down to 14·3. In 1872 the gas was on five occasions below the maximum standard of 14 sperm candles. In January and February last it was three times below the maximum, showing that in 1872 10 per cent. of tests registered below the minimum, and in 1874 36 per cent. of tests registered below the minimum. These he considered conclusive evidence in favour of the allegation that the gas was gradually becoming more deficient in illuminating power. The next primary complaint was that of excessive registration, of which complaints were almost universal. The complaint was proven by the facts in a table which he had received from the gas-meter office, in which was shown the supposed errors in meters. Seven meters were tested in March, 17 in April, and 22 in May, the high proportion in April and May occasioned by the supposed excessive and varying records of meters. He also quoted the cost of gas at the Central Exchange Art Gallery, in which, without any known increase in consumption, he had been charged this year, as compared with last, with an excess of 109,000 cubic feet. He then referred to the cause of bad illuminating power, and he stated that one great cause was the inferiority of the coals used. He was happy to say that at the present time that evil was to some extent being removed. The next cause of bad illuminating power was that the coals were kept too long in the retorts, as the quality of the gas was deteriorated by being kept longer in the retorts than four hours. With reference to the question of high registration, it arose from the low illuminating power of the gas and through the high pressure in the mains. The philosophy of economy in gas was low pressure, ample supply, and high illuminating power. The pressure was too high in their mains. Complaints were made of deficiency in pressure, but the real ground of the complaint was not deficiency of pressure, but deficiency of illuminating power. The pressure was at present too high; being at the works 36-10ths of an inch, and being delivered in the town at 25-10ths of an inch. The proper pressure for the area of consumption should be, not 25-10ths, but 15-10ths; and, in consequence of that excessive pressure, much gas was passed through the meters which was not burnt, but was merely wasted at the burners. The waste was not only loss to the consumers but to the company. With reference to the price of gas, he thought that, under present circumstances, the cost should be reduced from 4s. to the original charge of 3s. 4d. per 1000 feet. While the gas was 3s. 4d. per 1000 feet the company, out of their revenue, were enabled to pay their shareholders 2½ per cent. The increase of charge from 3s. 4d. to 4s. meant an increase in the revenue of the company equivalent to 5 per cent. upon the share capital, making the profits of the company 7½ per cent., when by law they were only permitted to pay 5 per cent. But that was not all. When the company were paying 2½ per cent. the cost of coal was 20s. a ton; at the present time good gas coal was one-third less than it was. The number of tons of coal used by the gas company for the purpose of manufacturing 600 million cubic feet of gas, which was about the quantity they supplied, was about 66,000. Sixty-six thousand tons at 20s. a ton was, of course, £66,000; but the coal now only cost 13s., therefore it was one-third less than it was last year, and the saving to the company for coal alone was £22,000, which was equal to about 8 per cent. Eight per cent. added to the previous 7½ per cent. showed that the company at the present time were realizing a net revenue of 15½ per cent., leaving a surplus of 10 per cent. It might be said, however, that the 10 per cent. was reduced by the diminished value of the coke produced. Assuming that to be the case—assuming that the company sold 25,000 tons of coke a year, which he believed was about the quantity—the loss on coke was £8000, and the deduction to be made on account of coke, from the 15½ per cent. net profits, was 3 per cent., leaving a net profit amounting to 12½ per cent. He urged these facts upon the consideration of the council, and trusted that the Gas Committee of the corporation would make an exhaustive examination of the whole question, and report to the council at their earliest possible convenience, and he further hoped that the committee would act fairly to the gas company, fairly to the consumers, and furnish an exhaustive report.

Mr. W. H. STEPHENSON, chairman of the Gas Committee of the corporation, seconded the motion, and stated that the secretary of the gas company attended the last meeting of the committee prepared to give any information desired. He (Mr. Stephenson) did not altogether agree with Mr. Barkas, but he thought sufficient had been said to influence the council in delegating the matter to the committee, to report upon the high prices, the increased quantity of registration, and the present standard of illuminating power.

Alderman BELL said it must be a matter of indifference to the council what mode of manufacture was followed by the gas company so long as the town did not suffer by it, and it was with results only they had to deal. Not long ago the complaint against the gas company was the deficiency in the quantity of gas supplied. The company had now remedied that state of things, having increased their make from 382 millions to 412 millions per annum. It was not their duty to see that the gas which passed through the meters was properly used, but simply to see that the meters, as they were constructed and maintained, indicated correctly and truly the quantity of gas passed to the consumer. When the consumer dealt improperly with the gas—allowed it to flare up and dealt unscientifically with it—were they to hold the gas company accountable for it. It was the consumer and not the gas company who should be held accountable for that. Regarding the profits which the gas company appeared to receive, according to the statements which had been made, he imagined that it would be quite time enough for them to apply to the gas company for a reduction when the profit had been realized, rather than lay any claim to it upon mere calculation. They were told that the illuminating power had fallen gradually since 1871, but in answer to that it might be said that there was all the illuminating power provided that was required by the Act. In regard to the quality, while they were supplied with gas of the full illuminating power, if the gas company had been considerate enough to afford them gas with one-third the amount of sulphur, they might have passed with it. He was quite willing to join with those gentlemen in getting better terms from the gas company if it were possible, but it was not fair to deal with the company as though through them the town had been injured. They received the quantity of gas they consumed, and the amount they had now to pay for gas arose from the fact that they burnt a good deal more, and because of the extra price charged for it. As far as he could see, there was not much good in referring the matter to the committee.

Mr. R. B. SANDERSON said he thought it was due to the gas company that he, as chairman of the Parliamentary Committee, should remind the council of the terms as to dividends, under which the gas company at present pleaded they could not pay a dividend exceeding 5 per cent. if the price of gas was above 3s. 4d. per 1000 cubic feet. Therefore if Mr. Barkas's calculation were correct, it would do the shareholders no good at all, because the directors could not pay more than 5 per cent. until the price of gas was reduced to 3s. 4d. per 1000. The gas company were compelled by Act of Parliament to give details of the expenditure, and therefore it was open to the corporation to ascertain whether they were working honestly or dishonestly. He mentioned these two facts, lest it should go forth that the gas company were prepared to give 7½ per cent.

Alderman HEDLEY (a director of the gas company) said his board had nothing to hide, and that their books were always open to the inspection of the committee or any member of the council. He referred at some length to the difficulties which all gas companies had of late had to contend with, and assured the meeting that it was the great wish of the company to supply gas of the best quality at the most moderate price.

After some further conversation, the motion was put and carried.

KIRKWORTH GAS COMPANY.—At the annual meeting of this company on the 1st inst., Mr. Grant in the chair—a dividend at the rate of 6 per cent. was declared, leaving a balance of profits on the last year's working of £111.

## IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is no improvement in trade here. No activity is observable in any single branch of industry, and in the majority of instances the outlook is by no means of so hopeful a nature as it was considered a couple of months back.

The cast steel trade is a pertinent example of what I have just stated, and there can be no doubt that its present dulness is wholly unprecedented since the period of the Crimean War.

The founders are, in many cases, doing an eminently satisfactory amount of work; but these are chiefly the leading firms who make certain classes of work specialties, and so command a fairly good demand. The smaller firms can hardly be said to be so well employed. North Yorkshire pig iron is still upheld in price, being now quoted as under:—No. 1 foundry, 82s. 6d.; No. 2 foundry, 78s.; No. 3 foundry, 72s. 6d.; No. 4 foundry, 65s. to 67s. 6d.; No. 4 forge (grey), 60s.; No. 5 mottled, 60s.; white, 57s. 6d.; refined metal, 80s., kentledge, 75s.; and cinder, 52s. 6d. In a few instances these rates are not strictly adhered to.

The Rotherham Brass-Works are still well employed on plumbers and general water-works fittings.

There is a somewhat improved business doing in steam coal for the Humber ports from the collieries in the Normanton district and South Yorkshire generally. On Tuesday last, a meeting of the South Yorkshire Steam Coalowners Association was held at the King's Head Hotel, Barnsley, when the business transacted was, in the main, of a routine character. No official change was declared in prices, which remain at from 13s. to 14s. per ton for this class of coal. House coal can be had in any quantity at about 10s. per ton at the pit's mouth. The question of the miners wages can hardly yet be looked upon as being settled. A delegate meeting, attended by the representatives of about 24,000 miners, was held at Barnsley on Monday; and, after a long discussion, it was decided to adhere to the decision previously arrived at—viz., to accept a reduction of 10 per cent. on the increase of 57½ per cent. given since 1871. This resolution was conveyed to the secretary of the Employers Association. I am credibly informed that several of the employers will insist upon the drop, and that they will, therefore, in all probability, lock out their men.

In the Dronfield district, the coke producers have reduced hard coke by 2s. 6d. per ton.

The Wakefield Water Bill has by this time raised up the whole valley of the Don against it. Although it has been thrown out by the examiners, special and public meetings have, during the week, been held at Rawmarsh (Local Board), Doncaster (Town Council), Rotherham (Town Council), and elsewhere. At the last meeting it was stated that the bill would be petitioned against by the Duke of Norfolk, Earl Fitzwilliam, and the Earl of Effingham; so that the opposition will be on a most formidable scale.

## THE NORTHERN COAL TRADE.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the North of England is in a very exceptional position. The obstinate strike of the Cleveland iron miners is telling upon the coal trade of South Durham very materially. Few of them have gone upon short time yet, however; but they will have to do so very soon, if the difficulty is not got out of the way. The price of manufacturing coals is lower, and it is beginning to tell upon gas coals, which may be quoted at little more than 12s. per ton, with a very dull business in the open market. Households are moderate, and best steam coals are less inquired after. The strike of the Cleveland miners has not been felt in general trade upon the Tyne, as in the Tees and Auckland districts; though at the same time, from the absence of foreign orders, business does not show much life. There was a slight improvement in the demand for chemicals last week, and some articles were quoted at a trifle more money. The strike in Cleveland has occasioned all classes of iron to be higher, though there seems a fair amount of stock in the district, and there is yet a large quantity of iron ore at the principal works.

There was a limited supply of ready sailing coasting tonnage upon the Tyne and Wear last week. In consequence, freights to the bye-ports were somewhat firmer. The Tyne and Wear are extremely well supplied with steam tonnage, which can place any quantity of gas coals in large towns like London, Rochester, Southampton, Plymouth, and Portsmouth; but what are called the bye-ports, especially those situated in the British Channel, have to depend upon small sailing vessels for their principal supply. A successful attempt has been made to run small steamers from Amble and Seaham to the Dutch ports with coals, but hitherto the smaller ports in the British Channel have not availed themselves to any large extent of steamers for their coal-carrying business. It seems somewhat strange that the steam carrying trade has not been better adapted for the smaller ports, as the difference between a regular supply of coals by steamer, with something like a uniformity of freight, compared with the uncertainty that attends sailing ships, must be considerable. The price of cement, an article of extensive manufacture in the North, with other material used for building purposes, tends downwards. Fire-clay goods, however, are in considerable demand for the Continent, and quantities are shipped on board steamers every week for Rotterdam and Antwerp. The upward tendency of timber appears to be checked. There are heavy stocks of certain sorts, especially those used for mining purposes, upon the Tyne and neighbouring rivers. Fewer cargoes have been coming to hand during the last month in consequence from the north of Europe.

BIRMINGHAM WATER SUPPLY.—Dr. Hill, the medical officer of health for Birmingham, reports that the water supplied to that town in May was very turbid, and greatly in want of filtration; it contained a large proportion of highly nitrogenized organic matter.

FOREIGN AND COLONIAL GAS COMPANY, LIMITED.—The works of this company for lighting the city of Tunis (which contains 200,000 inhabitants) have just been completed, and the first illumination of the streets with gas was celebrated with great rejoicings in the presence of the Court, and the representatives of all the foreign powers.

MARKET HARBOROUGH GAS COMPANY.—The annual meeting was held on the 1st inst.—Mr. T. J. Smith in the chair. The directors report, which was an extremely favourable one, recommended a dividend of 12 per cent., and a bonus of 5s. per share of £50. The directors also reduced the price of gas from 5s. 7½d. to 5s. per 1000 feet, and the coke to 15s. per ton.

BIRKENHEAD GAS AND WATER SUPPLY.—The accounts presented at the adourned meeting of the Birkenhead Commissioners, on the 29th ult., showed that the total receipts in the gas and water department, for the year ending the 31st of March last, amounted to £65,290, and the expenditure to £64,782, leaving a balance to the credit of the account of £508.

EAST GRINSTEAD GAS COMPANY.—The annual general meeting of the shareholders of this company was held on Monday week, when a satisfactory report was read and a dividend declared of 10 per cent. The price paid for gas is 6s. 8d. per 1000 feet, and from the balance-sheet it appeared that the receipts of the last year were for gas £1021 1s. 10d.; for coke, &c., £270 17s. 2d.; and the payments £1173 15s. 8d. There is a balance in hand of £318 12s. 5d.; which with coals, coke, &c., in stock make up the assets to £341 19s. 6d.; liabilities *nil*.

DARLINGTON (CORPORATION) GAS-WORKS.—Owing to the rapid growth of Darlington, the corporation have found it necessary to make immediate provision for the large increase in the consumption of gas which has taken place of late years, and is still going on. With a view to the erection of new works, they have purchased a site near to the present gas-works. Several plans for the construction of new works have been submitted to the Gas Committee, and they have approved of the designs and arrangement prepared by Mr. W. B. Emmerson, the resident engineer, to whom they have entrusted the carrying out of the whole. Mr. Emmerson's plan is for an entire new works capable of producing about 100 million cubic feet of gas yearly, and so arranged that the works could easily be duplicated when occasion requires it. It is expected that the whole will be completed in about two years.

ST. PANCRAS GAS CONSUMERS PROTECTION ASSOCIATION.—On Thursday evening last, a meeting of the subscribers of this association was held, to consider the advisability of continuing the association. Mr. Hillyer presided, and there were ten subscribers present. At a meeting of the committee held a short time ago, it was sought to dissolve the association, and return the money in hand to the subscribers, but by a majority of one, it was decided to call this meeting to hear the voice of the subscribers on the subject. It was now agreed that it would be unadvisable to dissolve the association, as the gas companies might have to be opposed next winter. The chairman informed the meeting that he found from the book that the number of subscribers was 254, being 100 at 1s. each, about 50 at 2s. 6d., and the rest at 5s., 7s. 6d., 10s., and upwards to one at £10 10s.! The balance-sheet showed that the total receipts amounted to £89 8s., and the expenditure to £29 10s. 11d., leaving a balance in hand of £39 17s. 1d. It was stated that Mr. Churchwarden Salter wished to retire from the position of treasurer, and that Mr. Kingston would no longer act as secretary. Ultimately the following resolutions were passed:—1. "That the association still exist, to watch the future interests of its members." 2. "That Mr. Hillyer be appointed hon. secretary *pro tem.* of the association." 3. "That Mr. Bangs be empowered, with Mr. Hillyer, to call upon Messrs. Salter and Kingston, to know their intentions towards the association." The meeting was adjourned for 14 days, to hear the replies from those gentlemen, and to decide upon future action.

TROWBRIDGE WATER-WORKS.—An important case affecting the cost of easements for laying water-pipes in the West of England, was heard at Trowbridge, on the 28th ult., before a jury and the under-sheriff for Wilts. The water company's main-pipe will, for a length of 533 yards, pass through pasture lands owned and occupied by Mr. John Francis, who claimed, for easement and damage, the sum of £170, which is about £7 per chain. He also claimed the sum of £330 for damage to a water meadow, which he alleged would be sustained by him in consequence of the proposed abstraction of water from the Biss Springs. The claimant's case was supported by numerous witnesses, amongst whom was Mr. W. B. Wood (Chippenham), Mr. Wainwright (Shepton Mallet), Mr. Sturge (Bristol), and Mr. H. Spackman (Bath), the two last-named stating that in all the very extensive cases of a similar kind in connexion with the Bristol Water Company and the Bath Corporation Water-Works, they had by agreement paid sums varying from £4 to £6 per chain for easement only, the surface damage being assessed separately. The same witnesses wholly or partially supported Mr. Francis's claim for alleged damage to water meadow. On behalf of the company, it was contended that the sum claimed for easement and damage was excessive, and not based upon any just principle. They offered the sum of £26 13s., but disregarded the claim for water meadow. The witnesses called to justify the company's views were—Mr. E. Ryde (Westminster), Mr. Squarey (Salisbury), Mr. J. G. Foley (Trowbridge), Mr. Parry (Calne), Mr. Coombs (Devizes), Mr. Henry Tomlinson, the company's engineer, and others. After a long and patient hearing, the jury awarded £19 19s. 9d. to Mr. Francis, as owner, and a similar sum as occupier, in each case, being at the rate of 16s. 6d. per chain. They made no award as to the water meadow, being of opinion that the evidence was insufficient to establish any claim. Mr. H. C. Saunders (instructed by Messrs. Keary, Stokes, and Goldney, of Chippenham), appeared for Mr. Francis, and F. J. Norris (instructed by Messrs. Clark and Collins, of Trowbridge) for the company.

# Legal Intelligence.

## COURT OF CHANCERY.—WEDNESDAY, JUNE 3.

(*Before Vice-Chancellor* BACON.)

### WOOD *v.* THE HARROGATE IMPROVEMENT COMMISSIONERS.

Mr. KAY, Q.C., and Mr. FREELING appeared for the plaintiff; Mr. FRY, Q.C., Mr. H. M. JACKSON, Q.C., and Mr. CHAPMAN BARBER for the defendants.

The plaintiff is the lessee of certain bleaching works situate on a stream called the Oak Beck, a little below Know Bridge, near Harrogate. The defendants are the local authorities who have control over the sewage of the district of High and Low Harrogate under an Act of Parliament passed in 1841. The natural drainage of the district was by three small streams, which united into one called the Coppice Beck, which falls into Oak Beck some distance above Know Bridge. Prior to 1862 there was no general system of sewers for the district. The commissioners then constructed drains and sewers, the discharge from which all found its way into Coppice Beck, and thence into Oak Beck, the water of which became considerably polluted. In May, 1866, Mr. Wood instituted a suit to restrain the commissioners from discharging sewage into Oak Beck so as to injure the plaintiff's bleaching operations, and for damages. That suit was compromised on terms of the commissioners paying £580 for damages and the costs of the suit, and agreeing not to discharge sewage into the stream flowing into the Oak Beck or the Oak Beck itself, or otherwise foul the stream, after the 31st of March, 1869. The commissioners procured a piece of land on the bank of Oak Beck above the point where Coppice Beck falls into it, and used it as a sewage farm; but some sewage, chiefly from the Bath Hospital and a slaughter-house, was still allowed to fall into Coppice Beck; and, as the Vice-Chancellor held on the evidence in this suit, from the sewage farm itself a certain amount of sewage not defecated was allowed to fall into the Oak Beck. This suit was instituted to restrain the commissioners from continuing to pollute the stream. The bill was founded on the agreement. The plaintiff had discontinued his bleaching operations at the works in question for the time, in consequence of the state of the water. In addition to an injunction he asked for damages. There was the conflict of evidence which is frequent in these cases, the defendants bringing forward scientific evidence that the water had been analyzed and found pure, and evidence of bleachers that they had used water taken from the beck and found it suitable for bleaching. They also endeavoured to prove that the damage to bleaching was occasioned by the presence of iron in the water.

The VICE-CHANCELLOR was of opinion that the evidence showed there was material damage done to the plaintiff, due to sewage passing from drains over which the defendants had control. The plaintiff's evidence distinctly proved the presence of fœcal matter. He said the analysis taken on behalf of the defendants might have been made after the water was allowed to stand. There was nothing to show the circumstances under which it was taken. Similar remarks were applicable to the evidence of bleachers; this evidence must, then, be rejected. The plaintiff was entitled to have the agreement carried out in the same way as an actual decree of the court, and was not under obligation to prove actual damage, which he had, however, proved, and was therefore entitled to the decree he asked for.

### THE MAYOR OF HALIFAX *v.* THE LOCAL BOARD OF SOOTHILL UPPER.

By virtue of certain Acts of Parliament passed in the years 1868 and 1870, the Corporation of Halifax were enabled to construct reservoirs on, and procure water from, a tract of moorland on the Saville estate. Provisions were inserted in these Acts to carry out an agreement made with Mr. Henry Saville, the tenant for life of that estate, under which he withdrew parliamentary opposition in

consideration of those provisions being inserted to protect the water supply of the Saville property. The effect of these provisions was that the three townships of Soothill Upper, Thornhill, and Mirfield, which were to a great extent situated within the Saville estate, should be entitled, on giving notice, to receive a water supply from the Halifax Corporation. A local board was formed for the township of Soothill Upper, and notice was given to the Halifax Corporation to supply them with water. The necessary works have been constructed, and Soothill Upper is receiving water from Halifax. Under existing circumstances the corporation are bound to supply the local board with a maximum of 45,000 gallons a day, at the rate of 6d. per 1000 gallons, and the Soothill Upper Board are bound to pay for a minimum of 25,000 gallons a day. They have contracted to resell water thus supplied to them to the Horbury Local Board at the rate of 11d. per 1000 gallons. The plaintiffs considered such a sale a misuse of the water supplied by them, and filed this bill to restrain the Soothill Upper Board from supplying Horbury with water. The bill was demurred to.

Mr. H. M. JACKSON, Q.C., and Mr. INCE argued in support of the demurrer; Mr. KAY, Q.C., and Mr. W. BARBER in support of the bill.

The VICE-CHANCELLOR said the question was entirely on the construction of an Act of Parliament. The defendants were acting within the limits of their power. The provisions of the Act which gave them a supply were not entirely beneficial; they were partly onerous. They were bound to pay for 25,000 gallons a day. It could not be said that they were not to sell what they did not themselves require. The case was, therefore, entirely different from that of a railway company, who would not be allowed to put into force their compulsory powers in order to sell property taken by them to some one else who wanted it. The demurrer was, therefore, allowed.

THURSDAY, JUNE 4.
(*Before Vice-Chancellor* HALL.)

EXMOUTH AND BUDLEIGH SALTERTON WATER-WORKS *v.* BRYCE.

Mr. DICKINSON, Q.C., and Mr. KARSLAKE appeared for the plaintiff; Sir J. KARSLAKE, Q.C., and Mr. INGLE JOYCE for the defendant.

This was a motion to restrain the defendant, his engineer and agent, from diverting the springs, or streams of water, to which the Exmouth and Budleigh Salterton Water-Works Company laid claim under their Act, or from obstructing the water from such springs, streams, brooks, or their tributaries from flowing into the plaintiff's reservoirs. The company, under their Act, were bound to give an adequate water supply to Exmouth, Budleigh Salterton, and various other parishes, and the allegation was that the defendant had constructed a large tank, into which he diverted water which would otherwise flow in the plaintiff's reservoir; and that by means of pipes into the said tank he drew 70,000 gallons of water daily, and could draw a great deal more. The result of this was to greatly diminish the water supply for Exmouth, Budleigh Salterton, and elsewhere; and it was alleged that if this were allowed to go on the company would be unable at certain seasons of the year to supply Exmouth and Budleigh Salterton with the water they were bound to supply under their Act. The defendant claimed the right of diversion, the water not coming from a spring.

The VICE-CHANCELLOR declined to enter into the question of construction of the Act on a motion for an interlocutory injunction, and the case, therefore, stands over generally with liberty to apply.

VICE-CHANCELLOR'S COURT.—TUESDAY, JUNE 2.
(*Before Vice-Chancellor* BACON.)

*Ex parte* THE GASLIGHT AND COKE COMPANY.

This was a petition, under the common seal of the company, praying for the payment out of court of the sum of £500, under the following circumstances:—By their Act the company were empowered to make a railway from their works at Beckton, and the land in respect of which the £500 was paid into court was taken under the powers of that Act. The company, since paying in the money, had paid £1320 to the representatives of one Eleanor Sarah Brand, and the conveyance of the property had been made to the company.

Subject to supplying an omission, consisting of the names of the trustees, and the production of a consent brief, or an affidavit of service, the court made an order as prayed.

## Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

1896.—KIRKMAN, J., Chorley, Lancs, "Improvements in packing for the stuffing-boxes of steam-engines and pumps, and for other joints requiring to be made steam, air, or water tight." May 30, 1874.

1916.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in apparatus for filtering or separating liquids from solid matters contained therein." A communication. June 2, 1874.

1929.—SCHANZER, L. I. L., Odessa, Russia, "An instrument or apparatus for drilling and tapping or screwing mains under pressure, and attaching pipes, cocks, or connexions thereto." June 3, 1874.

1944.—HOWES, W. H., Curtain Road, Middlesex, "Improvements in means or apparatus employed in the manufacture of gas for lighting and heating purposes, part of which improvements is also applicable to gas-meters." June 4, 1874.

GRANTS OF PROVISIONAL PROTECTION.

1733.—PONTIFEX, E. A., Shoe Lane, London, "Improvements in apparatus to be used in drawing off water and other liquors, and in measuring the quantities drawn off." May 15, 1874.

1826.—GOODALL, R., Armley, Leeds, "Improved means or method of clarifying sewage and impure waters, and rendering the precipitate or 'sludge' combustible and useful as fuel." May 23, 1874.


The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

# GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

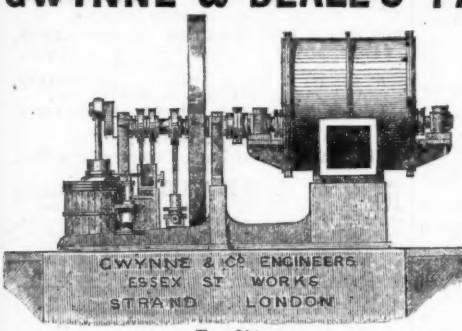



FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

Made under the personal superintendence of

**Mr. BEALE,**

The oldest Maker, Inventor and Patentee of

GAS-EXHAUSTING MACHINERY.

(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

*Prices and every information on application.*

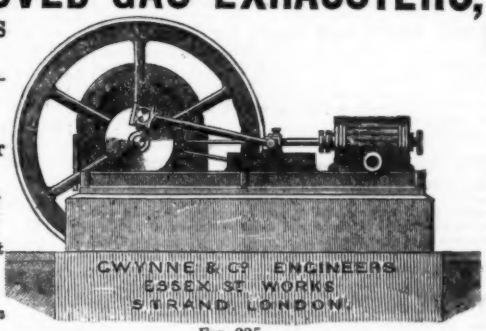



FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND CO. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,
CAN BE HAD ON APPLICATION TO
**GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.**
*G. & Co. are now manufacturing for a London Gas Company three of their* 210,000 *cubic feet Patent Gas Exhausters, and many of all sizes.*

**WANTED to purchase, 5000 to 10,000** tons of GAS COKE. Waggons can be sent to any station for any proportion of above.
Address G. J. EVESON, Gas Coal and Coke Merchant, STOURBRIDGE.

**WANTED, by the Advertiser, aged 29,** an engagement as ASSISTANT ENGINEER or Manager of a Gas-Work; 13 years experience in erecting and managing works, &c. Is a fair draughtsman. Has a knowledge of chemistry. Can analyze gas, &c., and use the photometer. Can furnish testimonials as to ability.
Address E. A., 18, Cawley Road, SOUTH HACKNEY, E.

**VINCENT'S**
PATENT IMPROVEMENTS
IN
**Apparatus for Manufacturing Gas.**
Particulars to be obtained by application to—
MR. LAYARD JONES,
ENGINEER,
25, OLD BROAD STREET, LONDON, E.C.

**ADVANTAGES OF GAS FOR COOKING AND HEATING,**
BY
MAGNUS OHREN, A.I.C.E., F.C.S.
For Companies to issue to their gas consumers.
Specimen Copy by post 4d., direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

**WANTED, an engagement as Manager** or MANAGER and SECRETARY of a medium sized Gas-Work. Thoroughly understands the manufacture and distribution of gas, having had many years experience, and can give most excellent testimonials as to character and ability.
Address MANAGER, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, a Working Manager, to** undertake the sole management, keep accounts, and collect quarterly bills, of a small Gas-Work (under one million consumption a year) in North Wales. He must be a strictly sober and honest man, and have a thorough practical knowledge of the setting and working of iron and clay retorts, and manufacture and distribution of gas, laying main and service pipes, &c.
Applications, with testimonials, stating age and wages expected, to be addressed to E., Post-Office, Amlwch, ANGLESEY.

**ROBUS, SIMPSON, & ROBUS,**
(Late of the Crystal Palace District Gas-Works, Sydenham, and the New City Gas-Works, Montreal, Canada,)
GENERAL CONTRACTORS & RETORT-SETTERS,
FITTERS & MAIN-LAYERS.
RETORTS SET ON THE LATEST IMPROVED PLAN.
*Retort-Setters sent to all parts of Europe and America.*
Address, J. and H. ROBUS,
BELL GREEN, CATFORD, KENT.

**WANTED, by a Gentleman, aged 27, a** situation as MANAGER, on the Continent or abroad. Advertiser has been four years in present situation, where the make is above 90,000,000 feet per annum. Understands the manufacture and distribution of gas in all its branches. Speaks French and Italian. Leaving present situation on account of salary being insufficient.
Address SCIENCE, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, at Midsummer, by the** Godalming Gas and Coke Company, a persevering, active, sober WORKING FOREMAN. He must thoroughly understand the management of clay retorts, be able to lay mains and services, and do gas-fittings efficiently. A smith would be preferred. House, coals, and gas found. State salary.
Applications, with testimonials, to be addressed to the SECRETARY, High Street, GODALMING.

Now ready, price 7s., by Post 7s. 3d.,
A SECOND EDITION (fcap. 8vo., morocco gilt)
OF
**THE GAS MANAGER'S HANDBOOK;**
CONSISTING OF
**Tables, Rules, and Useful Information for Gas Engineers, Managers,**
*And others engaged in the Manufacture and Distribution of* COAL GAS.
BY THOMAS NEWBIGGING, A.I.C.E.
WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

**WANTED, by the Advertiser, a situation** as Inspector, Main Inspector, or Out-door Superintendent. Aged 33 years; 15 years with a London Company.

Address INSPECTOR, 15, Broadhinton Road, Clapham, SURREY.

TO GAS STOKERS.

**WANTED, a steady and industrious** man, as LEADING STOKER, at the works of the Newton Gas and Coke Company, Limited. None need apply who cannot produce the most satisfactory testimonials as to character and ability, and who has had experience in Gas-Works. One who has some knowledge of the working of an exhauster preferred. House, coal, and gas found.

Application to be made by letter, stating wages required, &c., to Mr. JAMES CHAPPLE, Secretary, Newton Abbot, SOUTH DEVON.

**A GENTLEMAN, well connected with** Gas and Water Works, desires to be engaged as TRAVELLER, MANAGER of Gas-Works, or in any position of trust. Satisfactory references. Moderate salary.

Address A. K. K., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

NOTICE.

**A GENTLEMAN who has a patent for a** very valuable invention (for France) is desirous of obtaining the ASSISTANCE of some person who is acquainted with that country, and also with gas matters. The object is to find some one who could introduce the patent. Their return should be a share of the proceeds that may accrue from sale or otherwise.

For particulars apply by letter to A. B., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**FOR SALE, for One, Two, or Three years,** the surplus TAR and LIQUOR made at the Lichfield Gas-Works.

Particulars on application at the works.

**FOR SALE, a 150-light Dry Meter, per**fectly new, by one of the best makers. Warranted for six years, and stamped.

Apply to C. R., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SLIDE-VALVES.

**FOR SALE—14 12-in. and 5 10-in. Slide-**VALVES with outside racks. They have been thoroughly re-fitted, and are equal to new. A low price will be accepted to effect a clearance.

Apply to JAMES WATSON, Engineer and Manager, Crystal Palace District Gas Company, LOWER SYDENHAM, S.E.

**FOR SALE, and ready for immediate** delivery by the Barnstaple Gas Company, about 35 ft. of 12-in. Hydraulic Main, in five lengths; 15 ft. of 16-in. Hydraulic Main; cast-iron Stools for ditto; 21 15-in. Mouthpieces; a number of Ascension-Pipes, Bridges, and Dips; together with a quantity of odd castings suitable for a small work.

Feb. 26, 1874.

**TO BE SOLD immediately, Gas-Works** in good working order and within 10 miles of London, suitable for a mansion, comprising retorts, condenser, washer, purifiers, centre-valve, and gasholder. The above are on a gentleman's estate, and must be cleared off within fourteen days after the sale.

For further particulars apply to Mr. ALFRED LASS, 60, Cornhill, LONDON, E.C.

**TO BE SOLD by tender, the Plant of a** small GAS-WORK, consisting of Gasholder, 15 ft. by 12 ft., with two cast-iron columns; 14 ft. of 12-in. Hydraulic Main; 7 Mouth and Ascension Pipes, with dip-pipes; 3 Purifiers, with wrought-iron sieves and 2-in. connexions; a 2-in. Syphon; sundry lengths of 2-in. pipe and heads; 3 Furnace Doors and Frames; a 3-in. Pipe, Condenser, and Water Purifier; 8 Buckstaves and two Tar Pumps.

Tenders to be sent to Mr. S. BROWNING, Joint Counties Asylum, Abergavenny, on or before the 17th day of June current, from whom all particulars may be obtained, and where the said Plant may be seen.

GASHOLDER.

**TENDERS are invited for the con-**struction of a GASHOLDER, 60 ft. by 18 ft., on the works of the Cannock District Gaslight Company, Limited.

Plans and specification may be seen at the Gas-Works, Cannock; or on application to Mr. T. Proud, Engineer, 163, Icknield Street East, Birmingham.

Tenders to be sent to me by Monday, the 22nd inst.

The Directors do not bind themselves to accept the lowest or any Tender.

THOS. SMITH, Secretary.

**THE Directors of the Brentford Gas** Company are desirous of receiving TENDERS for the whole or a portion of 2000 chaldrons of COKE, now lying at their Southall Works.

Tenders to state the highest price per chaldron of 36 bushels, delivered into barges on the Grand Junction Canal, or into trucks on the Company's siding from the Great Western Railway, and time required for the removal.

Tenders to be sent in on or before the 17th inst.

The Directors do not bind themselves to accept the highest or any of the tenders. By order.

Any further information can be obtained by applying to FRANK MORRIS, Engineer to the Company, BRENTFORD.

TAR AND AMMONIACAL LIQUOR.

**THE Directors of the Sutton, Southcoates,** and Drypool Gas Company invite TENDERS for the whole of the AMMONIACAL LIQUOR and the surplus TAR made at their Gas-Works, Groves, Hull, from the 1st of July, 1874, to the 30th of June, 1875.

The Directors do not bind themselves to accept the highest or any tender.

Any further particulars may be obtained on application to the Manager.

Tenders to be sent to me, at the Gas-Works, on or before June 26, 1874.

F. W. OLDFIELD, Manager.

HYDRAULIC MAIN AND RETORT FITTINGS FOR SALE.

**THE Longton Gas Company have for** SALE the Hydraulic Main, Ascension-Pipes, Front Plates, and all the necessary fittings of a Bench of Brick Retorts. The above will be sold at a cheap price.

For further particulars apply to Mr. J. M. DARWIN, Gas-Works, Longton, STAFFORDSHIRE.

TO IRONFOUNDERS.

**THE Widnes Local Board are prepared** to receive TENDERS for the supply of about 800 yards of 9-inch Cast-Iron PIPES, with plain sockets. The Pipes are to be coated both inside and outside with Dr. A. Smith's patent black varnish. The price to include delivery free on rails, at Widnes Gas-Works. Further particulars, and a tracing of the Pipes, may be had on application to the undersigned.

Tenders to be addressed to the Chairman of the Gas and Water-Works Committee, endorsed, "Tender for Pipes," and delivered at the Gas-Works, Widnes, not later than the 27th inst.

The Board does not bind itself to accept the lowest or any tender. By order,

T. A. DREW, Engineer and Manager.

Gas-Works, Widnes, June, 1874.

TO METER MAKERS.

**THE Directors of the St. Helen's Gas** Company are prepared to receive TENDERS for the construction and erection of a STATION-METER, at their works, St. Helen's, Lancashire.

Tenders are required for the following sizes, viz.—to pass 20,000, 25,000, and 30,000 cubic feet per hour.

Specification may be seen at the Company's Office, St. Helen's, or a copy can be obtained on application.

Sealed tenders (for each of the above sizes) to be sent in not later than Wednesday, the 17th inst., addressed to the Chairman, endorsed "Tender for Station-Meter."

The Directors do not bind themselves to accept the lowest or any tender.

WILLIAM PRITCHARD, Manager.

St. Helen's, June 5, 1874.

ENLARGEMENT OF THE ILKESTON GAS-WORKS.

**THE Ilkeston Gas Company are desirous** to receive TENDERS for the Enlargement of their Works, viz.—

No. 1 Tender. Bricklayer's Work.—To include all work and materials, as described in plans and specifications, for the construction of Gas-Tank, 53 ft. 6 in. by 18 ft., Dry Well, Retort-House, Retort Stack of five arches, a Cottage upon the works, Fence, Walling, &c.

No. 2 Tender.—To include labour and materials for the construction of Gasholder, 52 ft. by 18 ft., with columns, girders, valves, &c.; also Iron Roof to Retort-House, Hydraulic Main, Condensers, &c., and to provide and fix two beds of Clay Retorts, six in each bed, with ascension, H-pipes, &c., as per plans and specifications, which may be seen at the Gas Company's Office, Ilkeston.

Tenders to be delivered at the said Office, directed to the Chairman of the Gas Company, not later than Twelve o'clock, on Monday, June 22 next.

The Directors do not bind themselves to accept any particular tender.—By order of the Directors,

B. WILSON, Secretary.

Ilkeston Gas-Works, June 1, 1874.

**DARLINGTON CORPORATION—GAS DEPARTMENT.**

TO BUILDERS, CONTRACTORS, AND ENGINEERS.

**THE Darlington Corporation invite** TENDERS for the following EXTENSIONS of their works, each contract to be tendered for separately;

CONTRACT No. 1.—For the Excavation, Puddling, Brickwork, &c., required to be done in the construction of a Gasholder Tank, 102 feet diameter, and 25 feet deep.

CONTRACT No. 2.—For the various works required to be done in the erection of a Retort-House, capable of containing 120 Retorts.

CONTRACT No. 3.—For the construction and erection of Wrought-Iron Roof for the previously named Retort-House.

Drawings, specifications, and conditions of Contract may be seen on and after the 18th inst., on application to Mr. WM. B EMMERSON, Engineer and Manager, Gas-Works, Darlington, to whom all tenders must be sent, properly endorsed, not later than the 22nd of June next.

The Corporation do not bind themselves to accept the lowest or any tender. By order,

H. DUNN, Town-Clerk.

TENDERS FOR COAL.

**THE Directors of the Bristol United** Gaslight Company are desirous of receiving TENDERS for the supply of about 60,000 tons of GAS COALS during the nine months between the 1st day of July, 1874, and the 1st day of April, 1875, to be delivered at their Works, situated at St. Philip's and Canons Marsh, Bristol, or at the Railway Station, Bristol, or f.o.b. at a port of shipment. The quantity to be made up partly of small and partly of large Coal, and to be delivered in such monthly proportions as may be required in accordance with the season.

Parties tendering can do so for the whole or any lesser quantity, and for periods of either one, three, six, or nine months.

The tenders must state the name or description of the pit, and the particular seam from which the Coal is to be supplied, and how much the contractor would undertake to deliver in each month of either small or large Coal.

The contractor to furnish an analysis of the Coal offered, and to deliver the Coals of the accepted tender strictly in accordance with such analysis, and also fresh, of the best quality, and free from sulphur, bats, binds, refuse, and dirt.

The Company to be at liberty to determine the Contract without notice if the Coals are inferior to the quality contracted for.

Payments to be made monthly in accordance only with the weight (20 cwt. to the ton) as weighed upon the weighbridges of the Gas Company at their respective stations.

Security for the faithful execution of the Contract to be given if required by the Company.

Tenders to be sent in to the Office of the Gas Company, Canons Marsh, Bristol, on or before Tuesday, the 23rd day of June proximo, addressed under seal to the Secretary, and marked "Tender for Coal."

By order of the Directors,

HENRY H. TOWNSEND, Secretary.

Gaslight Office, Canons Marsh, Bristol, May 29, 1874.

TENDERS FOR GAS COAL.

**THE Directors of the Tonbridge Gas** Company are prepared to receive TENDERS for the supply of 1300 tons of best GAS COAL, to be delivered at their works in the following order:—

| | | | |
|---|---|---|---|
| 200 tons | the first week in | August | next. |
| 200 | " | Sept. | " |
| 200 | " | Oct. | " |
| 300 | " | Nov. | " |
| 150 | " | Jan. | " |
| 150 | " | Feb. | " |
| 150 | " | March | " |
| 150 | " | June | " |

Tenders to be addressed and sent to the Secretary of the Company at Tonbridge, on or before the 20th of June inst., to state the name and description of the coal, and to be endorsed "Tender for Gas Coal."

The Directors do not bind themselves to accept the lowest or any tender.—By order,

June 5, 1874. JOSEPH SNELLING, Secretary.

**THE PRACTICAL GAS-FITTER'S** GUIDE (Second Edition), giving a detailed account of Gas Lighting, the cost of Gas-Works for Mansions, with a Sheet of Drawings. Post free for 30 stamps.

Address J. ELDRIDGE, 54, Murray Street, HOXTON, N.

Now published, second edition, enlarged, price 3s.,

**GAS PURIFICATION IN LONDON.**

Containing a complete Solution of the Sulphur Question, with general Remarks on Gas Purification. By R. H. PATTERSON, late Gas Referee; Author of "The Science of Finance," "The Economy of Capital," &c.

WM. BLACKWOOD AND SONS, Edinburgh and London.

Just published, a pamphlet, price 2s.

**METROPOLIS GAS SUPPLY: On the** Chartered Gas Revision, 1874, by ARTHUR SILVERTHORNE, C.E., a detail criticism of the late Award issued by the Board of Trade Commissioners respecting the Price of Gas supplied by the Chartered Gas Company in 1874.

LONDON: LIVERMORE AND ROBINSON, 41, BEDFORD STREET, STRAND.

Just published, price 10s. 6d.,

**REGISTRATION OF DISTRIBUTORY** PLANT.

The forms for this purpose are to illustrate the Paper on Distribution of Gas, read at the Edinburgh Meeting of the British Association of Gas Managers. By the use of the synopsis the whole of the out-door plant may at once be seen, with all matters pertaining to the same.

W. J. WARNER, Engineer.

South Shields.

TO GAS COMPANIES, ENGINEERS, MANAGERS, &c.

**DESIGNS & PLANS of GAS-WORKS,**

EXTENSIONS AND ALTERATIONS,

**DRAWINGS AND TRACINGS OF GASHOLDERS,**

TANKS, RETORTS, RETORT-HOUSE FITTINGS, ROOFS, GIRDERS, CONDENSERS, SCRUBBERS, ENGINES, BOILERS, EXHAUSTERS, PURIFIERS, GOVERNORS, VALVES, &c.,

Prepared with despatch, and at a moderate rate.

HILL AND CO.,

23, Southampton Buildings, Chancery Lane, W.C.

**MR. A. C. FRASER, Consulting** Engineer, 16, St. Swithin's Lane, is prepared to SUPPLY, on the shortest notice and on moderate terms, GAS-RETORTS in Fire-Clay or Iron, Plain or Ribbed, Pipes and sundry Castings, Fire-Bricks, Bolts and Nuts, &c., with every description of Fittings for Gas and Water Works.

**Mr. ALFRED LASS,**

60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

**MR. NORWOOD EARLE, late of the** Dover Gas-Works, is prepared, after 17 years experience, to undertake the duties of SURVEYOR to Gas Companies and Corporations in all matters relating to the Distribution of Gas and Gas Testing. Contracts entered into for the Survey of Mains, Services, Public Lamps, &c., in order to reduce the per centage of unaccounted-for gas to the lowest possible amount.

Valuations for Assessment, Transfer, and other purposes.

Arrangements made with Companies desiring the occasional use of an Office in the City.

12, QUEEN VICTORIA STREET, LONDON, E.C.

TO INVENTORS AND PATENTEES.

**MR. W. H. BENNETT, having had** considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 43, Parliament Street, WESTMINSTER.

**PATENT FUEL AND LIME FOR** PURIFYING FROM FOUL LIME.

By a simple process the Foul Lime is converted into Fuel, by the combustion of which the lime is reproduced as a purifying agent.

Licences to work the invention will be granted to Gas Companies on very reasonable terms.

For further particulars apply to Mr. E. MADDOCKS, Manager of the Gas-Works, KETTERING.

The adoption of the above invention, without a license from the Patentee, will be an infringement of the patent, and will subject the person or company guilty of such infringement to legal process.

**CATHELS'S Patent District Dry Gas-GOVERNOR** is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

For prices, &c., apply to the Manufacturers, Messrs. GURNEY AND CHRIMES, ROTHERHAM.

**CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE** is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.

For prices, &c., apply to the Manufacturers, Messrs. GURNEY AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

**BRONNER'S PATENT GAS-BURNERS** give 99 per cent. of light, as compared with 27 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.

HENRY GREENE AND SON, Sole Consignees of Brönner's Patent Improvements in Gas Lighting, 16 and 17, King William Street, LONDON, E.C.

**RICHARD THOMAS & CO.,**
40, GRACECHURCH STREET,
Manufacturers of
EWELL FIRE-BRICKS, CLAY, AND CEMENT.
Warranted the best quality.
WORKS AT EPSOM.

**E. GODDARD,**
**GAS-WORKS, IPSWICH,**
SOLE AGENT FOR
**EDGE'S PATENT**
FOR REMOVING THE
CARBONACEOUS INCRUSTATION FROM GAS-RETORTS.

**BAILEY'S Patented Inventions** are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

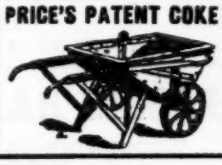
16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000.

**BAILEY'S Illustrated Inventions,** containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine; (4) Turret Clock, &c.; (5) Electric Telegraph, A B Instruments, Bells, and Apparatus.

J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

**THOMAS LAMBERT & SONS**
MANUFACTURE EVERY DESCRIPTION OF
GAS AND WATER FITTINGS;
ALSO,
WROUGHT-IRON TUBES & FITTINGS.
**SHORT STREET, LAMBETH, LONDON.**

**PRICE'S PATENT COKE & COAL BARROW.**



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

**BELGIAN CLAY RETORTS.**

**J. SUGG and CO., late ALBERT** KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

FIRE-CLAY RETORTS.
**WILLIAM FRASER,**
**INVERKEITHING,**
(Owner of the Works at which Fire-Clay Retorts were first made), can supply
RETORTS, FIRE-BRICKS, &c.,
to any extent.
References can be given to managers of above a hundred Gas-Works whom he supplies.
He ships at Charlestown his
CELEBRATED HALBEATH STEAM COALS,
on Navy List.

TO GAS COMPANIES.
GEORGE McKAIG,
MANUFACTURER OF
**GAS-PURIFYING WOOD SIEVES,**
153, CLEVELAND STREET,
**DONCASTER.**
It requires but one trial to prove the Superior Make, Strength, and Durability of these Sieves.

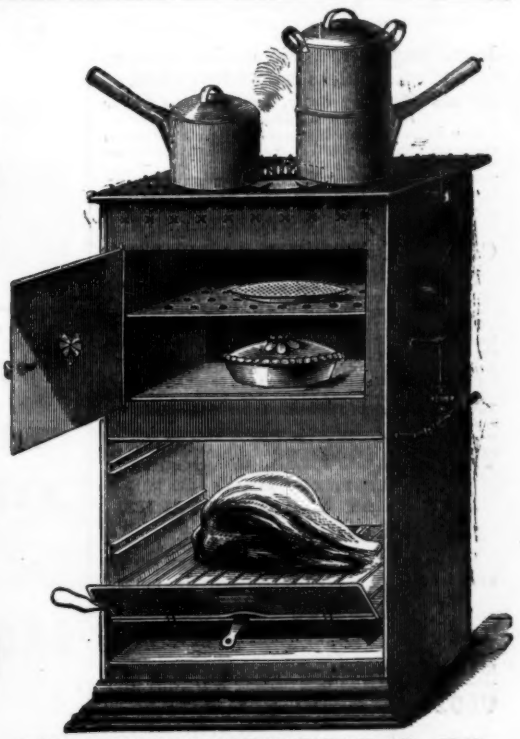
# GAS PURIFICATION & CHEMICAL Co., LIMITED,
(Successors to JOHN WILLIAM O'NEILL & CO.,)
**Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,**
# CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL,
SAMUEL H. JOHNSON,
} Joint Managing Directors.

**COMPLETE FAMILY GAS COOKING STOVE, No. 135. £5 5s.**

Size, 36 in. high, 18 in. wide; Hot-Plate, 22 in. wide × 16 in. deep, with Three Burners for Boiling. If with Bright Rail, 5s. extra. For Roasting, Grilling, Baking, and Boiling. It is fitted with all the latest improvements, capable of cooking a dinner for five to ten persons.



**SMALL FAMILY GAS COOKING STOVE, No. 139. £3 10s.**

Size, 29 in. high, 15 in. wide, 10 in. deep. Hot-Plate, 16 in. wide and 13 in. deep, with air and gas ring burner. This Stove will Roast a Joint of 6 or 7 lbs., or a couple of Fowls; Grill Chops, Steaks, and Bacon; Toast Bread, Bake Pastry, Rice Puddings, Potatoes, &c., and Boil, Fry, and Stew.

MANUFACTURERS OF
ASBESTOS GAS FIRES
AND
SUN BURNERS.

**BILLING & CO., 90, HATTON GARDEN, LONDON, E.C.**

**BIRTLEY IRON WORKS,**
CHESTER-LE-STREET,
DURHAM.
Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.
Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.
Agent in London, Mr. J. MANWARING, 101 Cannon Street E.C.

**HOPKINS, GILKES, & CO.,**
LIMITED,
MIDDLESBOROUGH,
SUPPLY GAS & WATER PIPES of EVERY SIZE.
Plain, Turned and Bored, and Coated.
CAST-IRON RETORTS.
Castings for Gas-Works of every description.
EXHAUSTERS.
LONDON OFFICE: 25, LAURENCE POUNTNEY LANE.

**OXIDE OF IRON.**—
We are prepared to supply, on moderate terms,
HYDRATED PEROXIDE OF IRON (BOG OCHRE),
Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.
FRANCIS RITCHIE & SONS,
BELFAST.

INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for
good quality of Fire-Bricks.
**WILLIAM STEPHENSON & SONS,**
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**BOUCK & CO., LIMITED,**
MANUFACTURING CHEMISTS,
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Also of their products.

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Dibdale Fire-Clay Works & Colliery,
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(ESTABLISHED 1834.)
MANUFACTURER OF EVERY DESCRIPTION
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Burs, Lumps, Stays, Shields, Blast Furnace and other Bricks & GAS-RETORTS.
*Red and Blue Clay Goods, Engineering and other Ironwork, and Fittings supplied.*
N.B.—Above works having been recently enlarged, orders of any magnitude for HOME or EXPORT Trade will receive immediate attention.

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ALBERT WORKS,
CHURCH STREET, BARNSLEY,
GAS ENGINEERS AND GENERAL COLLIERY FURNISHERS.
Plans, specifications, and estimates supplied, and contracts taken to furnish and erect Gas-Works complete, for supplying Manufactories, Collieries, Mansions, Halls, Railways, and other works.
Competent workmen sent out to town or country.
Agents for the supply of the best qualities of South Yorkshire House and Gas Coal. Prices and particulars on application.

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Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
Successors to
E. BAKER AND CO. LATE BRIERLEY HILL, STAFFORDSHIRE.

**CLOTH GAS-BAGS FOR MAINS,**

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather India-Rubber and Gutta-Percha Machine-Bands, Sheet and Washers Steam Joints.
T. BUGDEN, Manufacturer,
79, GOSWELL ROAD, LONDON, E.C.

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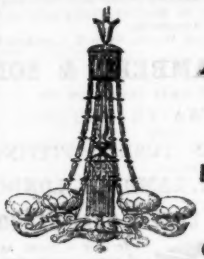
AND FOR THE
SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,
AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.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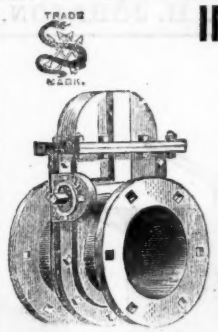
BROAD STREET, BIRMINGHAM.
ESTABLISHED 1807.
MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS
WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.
TABLE GLASS OF ALL KINDS.
CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

**THE THAMES BANK IRON COMPANY,**
(Successors to LYNCH WHITE,)
SUPPLY FROM STOCK
CAST-IRON RETORTS, SOCKET-PIPES for GAS or WATER PURPOSES, FLANGE-PIPES for STEAM, RAIN-WATER PIPES and GUTTERS, HOT-WATER PIPES and BOILERS, and all requisite Connexions for same; also LAMP-COLUMNS, LAMPS, WROUGHT FRAMES, WROUGHT-IRON TUBING, &c., &c.
*All kinds of Gas-Works Apparatus and General Castings made to Pattern or Drawing.*
ADDRESS—
OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.

**B. DONKIN & CO.'S**
**IMPROVED GAS-VALVES**
WITH WROUGHT-IRON PINIONS,

List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.
These Valves are all proved on both sides to 30 lbs. on the square inch before leaving the works, and are always kept in stock.
VALVES MADE WITH OUTSIDE RACKS TO ORDER.
ALSO, SCREW WATER-VALVES WITH GUN-METAL FACES.
ALSO SOLE MAKERS OF
J. BEALE'S NEW PATENT GAS EXHAUSTERS.
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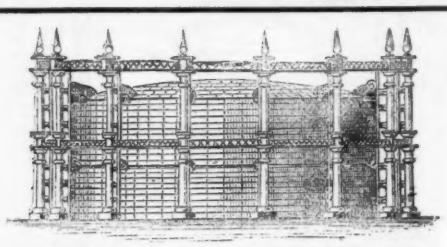
GENERAL ENGINEERS AND IRONFOUNDERS,
MAKERS OF STEAM-ENGINES,
BLUE ANCHOR ROAD, BERMONDSEY,
LONDON, S.E.

HOPE IRON WORKS,

STOCKTON ON TEES.

**ASHMORE & WHILE,**
**GAS ENGINEERS & CONTRACTORS,**
**MANUFACTURERS OF GASHOLDERS,**
GAS APPARATUS OF EVERY DESCRIPTION,
Including Improved
Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,
And GENERAL IRONWORK.
N.B.—Estimates for all Gas Plant and Remodelling supplied on application.

# ALDER AND MACKAY,

GRANGE WORKS, EDINBURGH,

MANUFACTURERS OF

## CONSUMERS IMPROVED GAS-METERS;

**IMPROVED DRY GAS-METERS, in Cast Iron and Tin Cases,**

OF THE HIGHEST EXCELLENCE,

Warranted to measure correctly, and not to vary.

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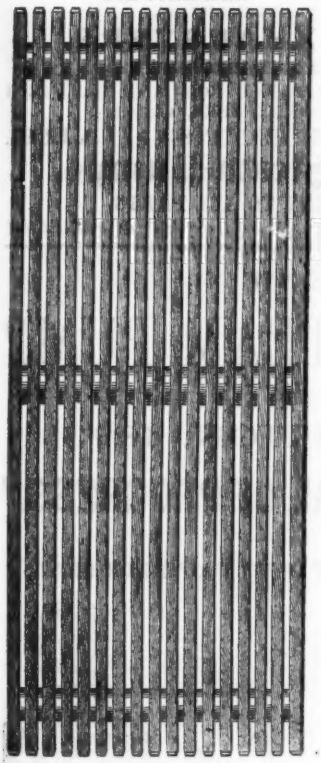
EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c.

PLAN AND SECTION OF WOOD GRID, FOR PURIFIERS.



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SPECIALITIES in WOOD

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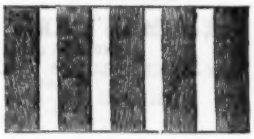
# PURIFIERS AND SCRUBBERS

VERTICAL SECTIONS OF THREE KINDS OF WOOD GRIDS FOR SCRUBBERS.



## FOR SCRUBBERS,

GRIDS OF PITCH PINE,

STRONGLY RECOMMENDED.

BROOKFIELD WORKS,

**103, ICKNIELD STREET EAST**

**BIRMINGHAM.**

TAPER BAR, TURNED BLOCK.

Scale 1½ Inch = 1 Foot.

Scale, One-Fourth Full Size.

Established

1795.

## JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

**NEAR LEEDS,**

MANUFACTURERS OF ALL DESCRIPTIONS OF

**FIRE GOODS, and Salt-Glazed Drain-Pipes.**

LONDON WHARF:

**Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;**

**LIVERPOOL—1, Back Leeds Street,**

*Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.*

**CLAYTON'S PATENT SIX-WAY** VALVE only requires one valve to work two purifiers; saves more than three-fourths of the connexion-pipes; requires neither tees, elbows, nor bends; no racks or springs to get out of order.
For particulars, apply to CLAYTON, SON, & Co., Gas Engineers, Hunslet, LEEDS.

**JAMES OAKES & CO.,**
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 20 & 22, WHARF ROAD
CITY ROAD, LONDON, N.,
Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.
N.B.—Orders for Cast-Iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention. CHARLES HORSLEY, Agent.

**HARRIS AND PEARSON,**
STOURBRIDGE,
Proprietors of
BEST GLASS-HOUSE POT AND CRUCIBLE CLAY;
Manufacturers of
FIRE-BRICKS, GAS-RETORTS, & FIRE-CLAY GOODS of every description.
Orders of any magnitude, for home and exportation, executed with all possible despatch.
N.B.—A quantity of Retorts in stock. Circulars, 15 in. and 16 in. Ovals, 20 in. by 14 in. D's, 15 in. by 13 in.; 16 in. by 12 in.; 18 in. by 14 in. 20 in. by 16 in.; 21 in. by 14 in.; and 24 in. by 14 in.

**THOMAS CARR & SON,**
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS, &c., &c.,
SCOTSWOOD FIRE-BRICK WORKS,
NEAR
BLAYDON-ON-TYNE.

**ADDISON POTTER,**
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

**B. CARPENTER,**
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**WOOD SIEVES**
FOR
GAS PURIFIERS & SCRUBBERS.
WORKS:
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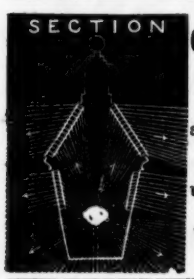
LONDON, N.

**DEMPSTER'S**
RENOWNED
WOOD SIEVES,
WITH TAPER BARS,
MADE BY MACHINERY
CAPABLE OF MAKING 10,000 FEET WEEKLY.
*References to Hundreds of First-Class Engineers.*
ROSE MOUNT IRON-WORKS
ELLAND, NEAR HALIFAX.




THE PATENT
**CATOPTRIC LAMP**
Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.
T. A. SKELTON, 37, Essex St., Strand, LONDON,
INVENTOR AND PATENTEE.

**GAS AND WATER PIPES.**

**WILLIAM MACLEOD & CO.,**
**18 & 20, ALSTON STREET, GLASGOW.**

**CAST-IRON GAS AND WATER PIPES.**
MALLEABLE IRON TUBE FOR GAS, WATER, AND STEAM.
AGENTS FOR THOMAS GLOVER & CO.'S
PATENT DRY GAS-METERS.
DELIVERY F.O.B. ON CLYDE.
*Lists on application.*

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GAS-METER MANUFACTURERS, BRASSFOUNDERS & FINISHERS,
ATLAS METER-WORKS, OLDHAM.
CONSUMERS WET & DRY GAS-METERS ON THE MOST APPROVED PRINCIPLES.
STATION-METERS, GOVERNORS, PRESSURE-REGISTERS,
And every Description of Gas Apparatus.
GAS, STEAM, AND WATER FITTINGS.

**ROBERT DEMPSTER,**
**GAS ENGINEER AND CONTRACTOR,**
ROSE MOUNT IRON-WORKS,
ELLAND, near HALIFAX,
MANUFACTURES AND EFFECTS
**GAS APPARATUS & MACHINERY**
OF EVERY DESCRIPTION.
**GAS EXHAUSTERS,**
WITH STEAM-ENGINES COMBINED.
DRY, CENTRE, AND BYE-PASS VALVES; WROUGHT-IRON AND CAST-IRON SCRUBBERS; ANNULAR AND PIPE CONDENSERS, ALL SIZES.
**PURIFIERS from 4 to 40 FEET SQUARE.**
**Steam-Engines and Steam-Pumps.**
RETORT SETTERS & FITTERS SENT TO ALL PARTS.
*ALL WORK AND MATERIALS GUARANTEED OF THE BEST DESCRIPTION.*

THE PATENT
**"UNIVERSAL" STEAM PUMP**
WAS AWARDED, AT THE
VIENNA EXHIBITION, 1873,
**THE GRAND PRIZE "MEDAL OF PROGRESS."**

OPINIONS
OF
THE PRESS.

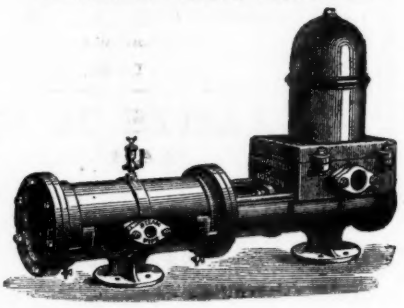
"The simplest machine of its kind."—*Engineering.*

"Remarkable for its simplicity and ease of action."—*Daily Telegraph.*

"None that we have noticed work so quietly."—*The Engineer.*

"Nothing invented in hydraulic steam power half so cheap and effectual."—*Griffith's Iron Trade Exchange.*

NO TAPPET VALVES OR GEAR.



IN USE IN SOME OF
THE PRINCIPAL GAS-WORKS IN LONDON, SHEFFIELD, PENISTONE, &c.,
FOR
TAR AND AMMONIACAL LIQUORS.

One selected from amongst many Testimonials received by H. T. & Co.:—

"*Ardwick Bridge Chemical Works, Manchester, Oct.* 28, 1872.

"Sir,—The 'Universal' Steam Pump obtained from you, and which has been employed during the last six months pumping caustic soda at these works, still continues working satisfactorily. "Yours truly,

(Signed) "PETER HART, *Manager.*"

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**HAYWARD TYLER AND CO.,**
**84 and 85, UPPER WHITECROSS STREET, LONDON, E.C.**

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MANUFACTURERS OF

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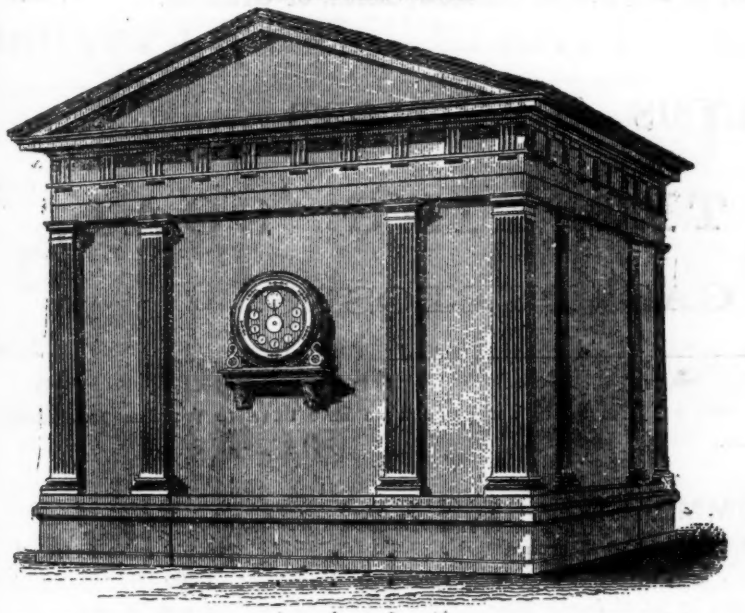
OF THE HIGHEST EXCELLENCE;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

**WATER-METERS SUITABLE FOR ALL PRESSURES.**

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

*Orders almost invariably despatched on the day of receipt.*

TERMS, &c., ON APPLICATION.

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## JAMES MILNE & SON,

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Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

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STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

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GAS AND CONSULTING ENGINEER,

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Mr. ANDERSON advises Companies on all matters connected with the manufacture of Gas and the construction of Works.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS, heated by tar without the production of smoke.

STEAM-ENGINES and EXHAUSTERS, separately or combined.

FOUR-WAY VALVES, one of which is equal to three ordinary Valves.

STATION GOVERNORS—the Gasholder cannot tilt and cause accident.

BREEZE AND TAR FUEL MACHINE.

A Pamphlet containing Eighteen Illustrations of the foregoing, with letterpress on the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains Illustrations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artisan.*

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CANNEL COAL.

## COPPA COLLIERY, MOLD,

Beg leave to call the attention of Gas Companies to the superior quality of their

CANNEL FOR GAS-MAKING PURPOSES.

This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.

Ports of shipment—Birkenhead or Connah's Quay.

Waggons supplied for delivery by railway to any part of England or Wales.

For particulars, prices, and rates of freight, apply to The Coppa Colliery, Mold, FLINTSHIRE.

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THE

## HUCKNALL COLLIERY COMPANY

Can offer a CANNEL COAL yielding a large quantity of Gas of superior quality.

Prices and information on application to the HUCKNALL COLLIERY COMPANY, Hucknall Torkard Collieries, near NOTTINGHAM.

---

POPE & PEARSON'S GAS COAL.—We have now the authority of several of the most eminent Gas Engineers of London in stating that our Coal yields *in practice working over 10,000 cubic feet of gas, with an illuminating power of 16 candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, West Riding and Silkstone Collieries, near LEEDS.

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## SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

*Established* 1840.

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## OMOA GAS COAL.

THE OMOA AND CLELAND IRON AND COAL COMPANY, LIMITED,

ARE NOW IN A POSITION TO

SUPPLY FROM THEIR PITS AT OMOA

GAS COAL

OF A VERY SUPERIOR QUALITY.

This Coal, according to the report of the analyst, yields 11,110 cubic feet of gas per ton, and has an illuminating power of 33·97 candles per 5 cubic feet per hour.

Copies of the analysis and full particulars as to price, &c., may be had on application to the SECRETARY of the COMPANY, 172, West George Street, GLASGOW.

---

EVERY DESCRIPTION

OF

## GAS COAL AND CANNEL

SUPPLIED BY

E. FOSTER & CO.,

COAL and CANNEL

MERCHANTS,

21, JOHN STREET, ADELPHI,

LONDON, W.C.

Prices Quoted on application.

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## LEE and JERDEIN,

COAL OWNERS & MERCHANTS.

Chief Office:

9, LANCASTER PLACE, STRAND, LONDON, W.C.

SOLE VENDORS FOR

LONDON & THE SOUTHERN COUNTIES

OF

WIGAN COAL AND CANNEL,

From the Mines of the

INCE HALL COAL & CANNEL COMPANY, Limited,

AND

Messrs. W. H. BRANCKER & Co.

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## JAMES NEWTON & SONS,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.,

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY,

and every Article suitable for

GAS AND WATER WORKS.

# WILSONTOWN GAS COAL.

**This Coal bears a close resemblance to the Lesmahago seam. It has a first-class Coke, equal to the Lesmahago, and greater in quantity, and 10,538 Cubic Feet of 33·2 Candle Gas.**

**For rail in Scotland, or shipped at Glasgow, Leith, or Granton.**

## ANALYSIS AND REPORT

ON

# CLIMPY TRIPPING COAL,

## FOR GAS PURPOSES.

The results of this analysis, as shown below, were got from actual working, and we have therefore the utmost confidence in placing it, along with that annexed, before you.

### COMMERCIAL RESULTS.

| | |
|---|---|
| Gas per ton of Coal—temperature 60°—barometer 30 inches | 10,200 cubic feet. |
| Coke per ton of Coal | 1,400 lbs. |
| Durability of one cubic foot of the gas, by jet of 5-inch flame | 48 min. 24 sec. |
| Illuminating power in standard candles | 14·9 |

### REMARKS.

Being well acquainted with Durham and Northumberland Coals, I have no hesitation in saying that "CLIMPY TRIPPING" is superior to any (containing, besides, a greater proportion of pieces from 7 to 14 lbs. weight), with far less impurities for purification, more gas, and coke equal in calorific power. It has a large mixture of cannel nuts, which accounts for the good quality of the gas, at our photometer in town, 1000 yards from the works.

It is also a very superior Coal for mixing with oils, as by Mackenzie's patent; or with acid tar, or tar oil, shale grease, or other refuse from paraffin-works, as by system of Mr. Scott, of Musselburgh, or Mr. Foster, Portobello, the Coal being easily crushed.

Below are the results realized by myself, when mixed with acid tar from paraffin work, received by me in a solid state, having been run on to very fine dross. My charges were 2 cwt. tripping and 28 lbs. of acid tar, each retort, running six hours; with lighter charges I get more gas, but not so good quality, or so much coke.

| | |
|---|---|
| Gas per ton of Coal | 10,800 cubic feet. |
| Coke per ton of Coal | 1,540 lbs. |
| Durability of one cubic foot of gas, by jet of 5-inch flame | 58 min. 28 sec. |
| Illuminating power in standard candles | 27·29 |

The first truck received being tried with very light charges (unmixed), and running five hours, I got 10,500 cubic feet of 14-candle gas; and I am confident, practical managers, with good retort-fittings (mine being very inferior), and exhausters at work, as I have seen generally at home and abroad, will take 11,000 feet of 13-candle gas from it. My retorts are 8 feet × 2 feet × 14 inches, D shape, heavy dip, and no exhauster.

These remarks of mine you may perhaps think rather lengthy, but they will be the more intelligible to any manager inquiring for Climpy Tripping.

L. MONK,
*Engineer and Manager.*

*Lanark Gas-Works, April* 20, 1874.

# GRAY AND PAUL,

## WILSONTOWN GAS COAL WORKS & CLIMPY COLLIERY,

### BY CARNWATH, N.B.

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**Delivery per Rail to any Part.**

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**MUIRKIRK, No. 1, CANNEL**
Yields 11,600 cubic feet of 34·3-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

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Yields 10,700 cubic feet of 32·77-candle gas per ton, and 9½ cwts. of coke, containing 11 per cent. of ash.

**OLD WEMYSS CANNEL**
Yields 12,550 cubic feet of 33-candle gas per ton.
*Prices and full Analyses on application.*

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THE DERBYSHIRE
## SILKSTONE COAL COMPANY,
**LIMITED,**
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## GAS COAL
**Of superior quality, delivered at any station in England and Wales.**

| | |
|---|---|
| Purified gas per ton of coal in cubic feet (average) . . . . . | 10,775 |
| Weight of coke in lbs. per ton of coal . . . . . | 1,465 |

ANALYSIS AND PRICES ON APPLICATION TO
**Mr. EDMUND TAYLOR, Secretary,**
**ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.**

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# DUKINFIELD CANNEL COAL.

## THE DUNKIRK COAL COMPANY.

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## THORNCLIFFE IRON-WORKS AND COLLIERIES,
NEAR SHEFFIELD,
STRONGLY RECOMMEND A TRIAL OF THEIR
## CELEBRATED SILKSTONE GAS NUTS.

**Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—**

(COPY.)

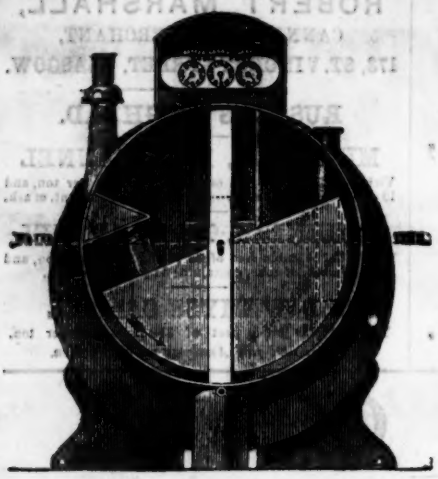
| | Cubic Feet of Gas per Ton of Coal. | Illuminating Power in Candles. | Coke per Ton of Coal used. | Ash in Coke, per Cent. | Sulphur in Coal, per Cent. |
|---|---|---|---|---|---|
| Silkstone Nuts . . . | 10·800 .... | 15·85 .... | 12·66 cwt..... | 6·0 .... | 0·69 |

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

*Horseferry Road, Westminster, March*, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

*APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.*



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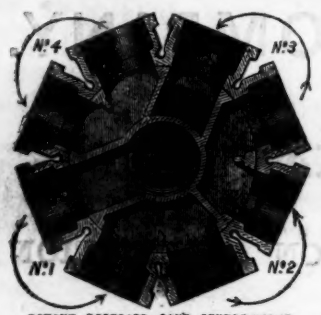


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*Sectional Plan.*

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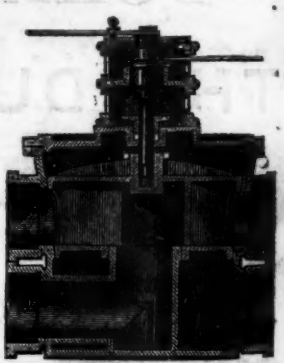
THROUGH-WAY & FOUR-WAY COCKS

Of all descriptions.



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